AN ANALYSIS OF MAINTENANCE PLANNING INFORMATION REQUIREMENTS FOR INTEGRATED LOGISTIC SUPPORT ORIENTED TO THE NAVAL ORDNANCE SYSTEMS COMMAND

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THESIS

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by

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An Analysis of Maintenance Planning Information Requirements for Integrated Logistic Support Oriented to the Naval Ordnance Systems Command

by

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ABSTRACT

This thesis utilizes a conceptual model for determining information requirements for one Integrated Logistic Support element (Maintenance Planning). The development is oriented to the Naval Ordnance Systems Command (NAVORD) by presenting the existing NAVORD system and using Naval Ordnance Requirements (OR-30) in the development of the information requirements.

Following a brief overview of Integrated Logistic Support and its system life cycle (acquisition phases) implementation, the specific data flows for Maintenance Planning are presented which identify the data or information, the source (input) and destination (output) of that data and the form/units of the data. A code is used to simplify the source/destination identification and a detailed alphabetic matrix shows a consolidated distribution of input and output locations for each data element.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

Aa	Availability (achieved)
Ai	Availability (inherent)
ADO	Advanced Development Objective
APP	Advance Procurement Plan
CDRL	Contract Data Requirements List
CM	Configuration Management
DCLE	Design Criteria for Logistics Elements
DCP	Development Concept Paper
DED	Data Element Definition
DID	Data Item Description
DOD	Department of Defense
DSARC	Defense Systems Acquisition Review Council
FMEA	Failure Mode and Effect Analysis
GOR	General Operational Requirements
ILS	Integrated Logistic Support
ILS/MIS	Integrated Logistic Support/Management Information System
IOC	Initial Operational Capability
LEM	Logistics Element Manager
LOR	Level of Repair
LSA	Logistic Support Analysis
LSAR	Logistic Support Analysis Record
MEA	Maintenance Engineering Analysis
MEAR	Maintenance Engineering Analysis Record

MEC	Military Essentiality Code
MIL-STD	Military Standard
MIS	Management Information System
MRC	Maintenance Requirement Card
MTBF	Mean Time Between Failure
MTBMA	Mean Time Between Maintenance Actions
MTTR	Mean Time To Repair
NARF	Naval Air Rework Facility
Navy 3M	Navy Maintenance and Material Management System
NTP	Navy Technological Projections
NAVORD	Naval Ordnance Systems Command
NWS	Naval Weapons Station
OMNIC	Ordnance Maintenance Management Center
PM	Preventive Maintenance
PMS	Preventive Maintenance System
PTA	Proposed Technical Approach
R/M/A	Reliability/Maintainability/Availability
ROH	Regular Overhaul
SECDEF	Secretary of Defense
SM&R	Source Maintenance and Recoverability Code
SOR	Specific Operational Requirement
SPD	Ship Project Directive
TAV	Tender Availability
TDP	Technical Development Plan
TM	Technical Manual
TSOR	Tentative Specific Operational Requirement
WBS	Work Breakdown Structure

I. INTRODUCTION

In the past twenty-five years, man has witnessed dramatic changes to his environment due to technological advancement. He has flown through space at better than 18,000 miles per hour; he has walked on the moon; he has communicated around the world in a matter of seconds. During this time the speed of electronic computation has gone from 16,000 additions per second to one and one-half million per second [1]. This rapid growth in technology has created a demand for corresponding growth in management techniques. The time rate of accomplishing managerial decisions has generated the need for selective decision-making on complex tasks rather than routine analysis on trivial problems.

Concurrent with the advancement of technology is what has been termed the "information explosion." Various estimates indicate man's knowledge is doubling in each five-to-ten year period with an increasing rate of growth.[1] This creates an extraordinary requirement for information processing to maintain current information for managerial analysis and informed decision-making.

The requirement to improve management techniques to cope with technological change is needed today in the public

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[1]Murdick, R.G. and Ross, J.E., Information Systems for Modern Management, p. 18, Prentice Hall, 1971.

sector of the economy as much as in the private sector. The cost growth experienced by such Department of Defense systems as the DD-963 and the F-14 may not be directly attributable to information processing but the need for improved management within DOD has been fully recognized by the Congress, Government Accounting Office (GAO), and DOD itself.

A. PURPOSE

The purpose of this thesis is to present a method for accomplishing improvement in information management in the area of Integrated Logistic Support (ILS) utilizing one representative ILS element (maintenance planning). The development has been specifically applied to the Naval Ordnance Systems Command.

B. SCOPE

This thesis presents the information flow (data elements or information requirements) required by the Maintenance Planning Logistic Element Manager (LEM) for decision-making during system development. The information data flow is based on the system life cycle since varying degrees of detail in data exist as a function of the stage of system development.

Finally, for illustrative purposes, the information flow is oriented toward the Naval Ordnance Systems Command (NAVORD), although it can be applied to any management

information system for Integrated Logistic Support. The emphasis is on the information flow required for decision-making rather than on the organization or individual making the decisions.

In order to provide a point of comparison, the existing ILS Program and ILS Management Information System (ILS/MIS) for the Naval Ordnance Systems Command is briefly treated.

Two concepts must be understood prior to developing specific data flows. These are the "System Life Cycle" concept and the "Integrated Logistic Support" concept. These are presented in the following sections.

C. SYSTEM LIFE CYCLE

The life cycle of a weapon system may be thought of as consisting of three primary periods: a period when it is planned, a period devoted to acquiring the system, and the operational or system use period. In accordance with Department of Defense (DOD) Directive 5000.1, the planning period is called the Program Initiation Phase of the System Life Cycle. This phase is further subdivided into two categories called Conceptual Effort and Advanced Development [2]. The period devoted to acquisition includes the Engineering Development and Production Phases. Finally, the system use period is the Operational Phase.

1. Program Initiation Phase - Conceptual Effort

The Conceptual Effort part of the Program Initiation Phase is defined to be that period of time between the

recognition of a need or operational requirement until approval for advancement by the Secretary of Defense (SECDEF) in the form of the Program Initiation Decision. Figure 1 shows the document flow in carrying out what has been called the "User-Producer" Dialogue in the Navy during this phase. Basically this dialogue consists of identification and analysis of requirements by the user and recommended methods for satisfying these requirements by the producer. This dialogue provides for the analysis of broad concepts of all aspects of system development for the purpose of providing viable alternatives to the Secretary of Defense. The recommended solution to satisfy the need, together with supporting analyses and documentation, is provided so that a rational choice for program development and national resource allocation can be made. A satisfactory recommendation by the Defense System Acquisition Review Council (DSARC)[2] and approval of the DCP by SECDEF allows the selected system to progress into advanced development.

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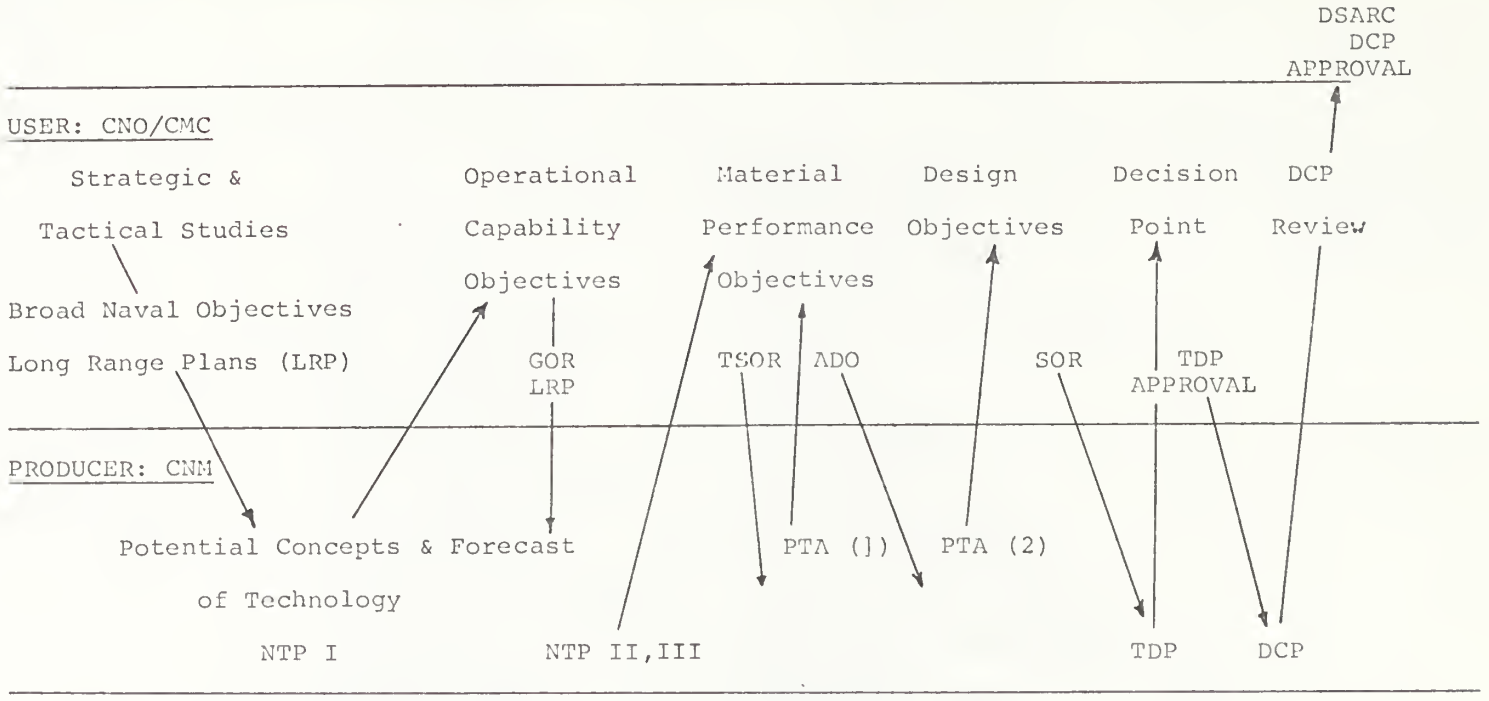
[2]The Defense Systems Acquisition Review Council (DSARC) is composed of the Director of Defense Research and Engineering (DDR&E) and the Assistant Secretaries of Defense (Installation and Logistics, Systems Analysis, and Comptroller). This council conducts periodic reviews of major defense programs during the Development Cycle and makes recommendations to the Secretary of Defense for his Program Initiation, Full Scale Development or Production Decision as indicated on Figure 2 [4].

RDT&E: PLANNING USER/PRODUCER



NTP	Navy Technological Projections
GOR	General Operational Requirements
TSOR	Tentative Specific Operational Requirements
ADO	Advanced Development Objective
PTA	Proposed Technical Approach
TDP	Technical Development Plan
DCP	Development Concept Paper
DSARC	Defense Systems Acquisition Review Council

(Adapted from Reference 3)

Figure (1)

PROGRAM INITIATION			
CONCEPTUAL EFFORT	ADVANCED DEVELOPMENT	ENGINEERING DEVELOPMENT	PRODUCTION/ DEPLOYMENT
◦ THREAT/ OPERATION NEED ◦ CONCEPT ANALYSIS ◦ TECH/ECON FEASIBILITY ◦ RISK IDENTIFICATION ◦ ALTERNATIVES ◦ COST ANALYSIS ◦ PRELIMINARY DESIGN FACTORS ◦ INITIAL CHAR/ SYSTEM SPEC	◦ UPDATE OPERATION NEED ◦ ADVANCED ANALYSIS ◦ TECH/ECON CONFIDENCE ◦ RISK RESOLUTION ◦ BEST ALTERNATIVE ◦ DEVELOPMENT & PRELIM. LIFE CYCLE COSTS ◦ TEST & EVALUATION ◦ ASSESSMENT ◦ DEVELOPMENT/ PROGRAM PLAN (TECHNICAL, COST, LOGISTICS, SCHEDULE) ◦ ADVANCED DEV. DESIGN	◦ UPDATE OPERATION NEED ◦ ENGINEERING DEVELOPMENT ◦ PROJECTED PRODUCTION COMPATIBILITY ◦ PRODUCTION CONFIDENCE (BASED UPON T & E STATUS) ◦ OPERATIONAL SUITABILITY ◦ LOGISTICS SUPPORTABILITY ◦ LIFE CYCLE COSTS ◦ PROGRAM COSTS WITH AFFORDABLE LIMITS ◦ PRODUCTION DELIVERY SCHEDULE ◦ PRODUCTION AND LOGISTICS SUPPORT PLAN	◦ FULL PRODUCTION ◦ OPERATIONAL/ SYSTEM USE PLAN ◦ INSTALLATION
DCP	DSARC I PROGRAM INITIATION DECISION	Updated DCP	DSARC II FULL SCALE DEVELOPMENT DECISION	Updated DCP	DSARC III PRODUCTION DECISION

Figure 2. Representative System Acquisition Cycle

2. Advanced Development

This phase is primarily associated with validating the need developed in the Conceptual Phase and to determine system design requirements as shown in Figure 2. Advanced Development Effort includes development of performance, cost, and schedule program plans, analysis of risks, risk resolution techniques, Preliminary Life Cycle cost analysis and development of a test and evaluation plan.

3. Engineering Development

The Engineering Development Phase is entered upon satisfactorily receiving the Engineering Development Decision resulting from DSARC II. The system is physically designed and developed from the system specifications developed in the previous phase. From the designs, prototype models are built and tested to determine technical and operational suitability, supportability, and producibility. Cost analysis is further refined as life cycle requirements become stabilized. An updated DCP and satisfactory DSARC review with SECDEF approval is required prior to committing funds for system production and ultimate deployment.

Within this general description of the System Life Cycle, the ILS elements can now be examined as a functionally required part of the System Life Cycle.

D. ILS DEFINITION AND DIRECTION

Integrated Logistic Support has been defined as "...composite of all the support considerations necessary to assure

the effective and economical support of a system for its life cycle...The principal elements of Integrated Logistic Support related to the overall System Life Cycle include:

1. The Maintenance Plan
2. Support and Test Equipment
3. Supply Support
4. Transportation and Handling
5. Technical Data
6. Facilities
7. Personnel and Training
8. Logistic Support Resource Funds
9. Logistic Support Management Information."[5]

Another definition which relates more directly with the approach this thesis will take in developing the management information system is as follows:

ILS = [Cost-Effective Planning, Acquisition, Management] ×[Maintenance + Supply] × [Activities + Resources] [6]

in other words, the management of maintenance activities, maintenance resources, supply activities, and supply resources.

DOD Directive 4100.35 states that logistic support planning shall commence at the Conceptual Stage so that special logistics problems can be identified early. It further states that the ILS Program must be formalized by the beginning of Full-Scale Development including

appropriate review and decision milestones. In essence, the degree of ILS development must depend on the degree of system design maturity.

Initial efforts by the ILS community to implement DOD Directive 4100.35 resulted in attempts to perform detailed logistic support analyses too early when the required information was not available. The other extreme was expressed by the Chief of Naval Material in a memorandum dated 28 March 1972 which states

> "I am concerned over the Logistic Support we are rendering the operating forces.... The recent visit of CNM IG to staff of CINCPACFLT, COMSERVPAC.... highlighted the fact that:
>
> a. Integrated Logistic Support planning information is received too late or not at all;
>
> b. Technical Publications are inadequate, outdated, and sometimes contradictory; and
>
> c. Supply Support is poor.
>
> Delivering hardware without the requisite logistic support does not provide the Chief of Naval Operations the capability he is seeking."[7]

DOD Directive 5000.1 states

> "Logistic Support shall also be considered as a Principal design parameter with the magnitude, scope and level of this effort in keeping with the Program Phase."[8]

The mandate for proper application of ILS effort and, therefore, timely information flow is obvious and is considered a prerequisite for development of a Management Information System for ILS.

In order to assist the reader to understand the magnitude of the integrated logistic support effort required during

Weapon System Development, each ILS element is synopsized. The material in this section has been developed from DOD Directives 4100.35, 4100.35G, 5000.1 and NAVMAT Instruction 4000.20A.

E. ILS ELEMENTS

1. Maintenance Plan

A maintenance concept is evolved from mission and operational objectives subject to various policies, constraints, and trade-off analyses. This concept is then developed into a specific plan which identifies utilization requirements for all maintenance support resources. (This element is the subject of this thesis and is developed in greater detail in Section III).

2. Support and Test Equipment

The effort involved in the support and test equipment element is to provide technical and procurement data for the support and test equipment required for the system being developed. This involves the support and built-in test equipment required for system-operation as well as that required for all maintenance activities.

Support and test equipment consists of tools, metrology and calibration equipment, monitoring and check-out equipment, maintenance stands and special maintenance or handling devices. The identification of requirements, design development and evaluation of this type equipment must be accomplished concurrently with the design and development of the prime system.

3. Supply Support

The planning and development effort of Supply Support involves evaluation of alternative supply concepts, techniques, provisioning procedures, requirements determination methods, inventory control techniques and supply facility locations all within stated policies and constraints. The resulting plans establish the requirements for all phases of Supply Support.

4. Transportation and Handling

This element includes functions relating to prime and support system compatibility for packaging, transportation and handling, and distribution systems.

Initial efforts includes conceptual studies to determine a cost-effective system for handling, packaging, transportation and distribution. The resulting concepts are then developed into plans and requirements which are contracted, managed, and evaluated throughout the life cycle.

5. Technical Data

The purpose of the technical data effort is to provide timely development of the data involved in all aspects of system operation and logistic support, i.e., operations, maintenance, supply, training, modification, repair and overhaul. It includes drawings; specifications; provisioning documentation; operating and maintenance cards and manuals; computer programs; and inspection, test, and calibration procedures. The data elements for Maintenance

Planning developed in this thesis are part of the technical data element.

6. Facilities

Facilities planning includes defining the types of facilities needed to support the system involved. Facilities include maintenance and supply facilities as well as those used for training.

The planning effort must include defining facility locations, space needs, equipment requirements, energy and other facility resources, housekeeping (utility) installations required, facilities use and development schedule. Because of long lead-time requirements for military construction (MILCON) funds, the funding requirements for facility construction or modification should be accomplished as early as feasible after system requirements are well defined.

In addition to planning, the Logistic Element Manager for Facilities must become involved in facilities design, contract solicitation, management and validation.

7. Personnel and Training

The development of this ILS element is oriented toward the quantitative and qualitative determination of numbers, skill levels, training, and assignment of all personnel required for the operation, maintenance, and support of the system or equipment under development.

Initial effort includes an analysis of existing personnel capability and a realistic evaluation of

projected personnel requirements constrained by types and skill levels available. Determination of skill level requirements, training required, and training resources needed provide the nucleus of the personnel and training plan. This precedes the establishment of training courses, procurement of training materials, and subsequent evaluation of training effectiveness.

8. Logistic Support Resource Funding

The budget and financial management interface with ILS development is primary to the entire concept of ILS, the desire to provide optimum support for the least cost.

The Technical Development Plan (TDP) as well as the Development Concept Paper (DCP) require that cost analyses and trade-offs be conducted and reported prior to approval of a specific system and its associated ILS concepts.

In addition to providing cost data for trade-off analysis, the resource funding manager must provide accurate near and long term forecasts of system costs. In most cases this will incorporate life cycle cost analysis.

After budgeting and receiving funds for ILS development, this manager is responsible for allocation of funds and accurate accounting of expenditures to insure proper utilization.

9. Logistic Support Management Information

This element considers the requirements previously established for this thesis. Determination of management information requirements, establishing information flow,

providing collection, analysis and control techniques, and determining hardware management information support requirements are a few of the inclusive functions.

F. NAVORD ILS PROGRAM AND ILS/MIS

The Naval Ordnance Systems Command (NAVORD) requirements for Integrated Logistics Support are contained in three instructions: NAVORDINST 4000.5A which provides policy and guidance for implementation within NAVORD of the ILS procedures and concepts promulgated by higher authority; NAVORDINST 4000.10A which establishes requirements for development of an ILS Plan and an ILS Management Plan; and NAVORDINST 4000.XX (Proposed) which establishes policy and procedures for developing, maintaining, and operating the Naval Ordnance Systems Command ILS/MIS.

NAVORDINST 4000.5A establishes responsibility for performing all ILS related functions. The Deputy Commander for Logistics Support (ORD-04) is responsible for overall policy guidance, program monitoring, and coordination of ILS procedures.

The Deputy Commander for Systems and Acquisition (ORD-05) is responsible for planning and implementation of ILS for systems and equipments under his technical cognizance. ORD-05 and each NAVORD-designated Project Manager is responsible for designating a NAVORD ILS Manager who is responsible for planning, development, acquisition and execution of ILS for each system or equipment acquisition.

In addition to establishing these responsibilities and denoting specific implementing actions to be accomplished by various directorates, NAVORDINST 4000.5A also defines the functions to be performed by the ILS Manager, ILS Agent, ILS Element Manager and the ILS Management Team. For example, the ILS Agent functions include preparation and update of ILS plans, participation on NAVORD ILS Management Teams, coordination and monitoring the implementation and execution of ILS planning, and reporting status and problems to the ILS Manager.

NAVORDINST 4000.10A states that the ILS Management Plan, which is developed early in the Planning Phase for each system, should provide guidelines for in-house ILS efforts, and outline responsibilities for monitoring the ILS Programs of other supporting agencies including the contractor ILS Program. The ILS Management Plan is used to develop logistic data for the Advance Procurement Plan (APP), Technical Development Plan (TDP), and the ILS Plan.

The ILS Plan identifies what ILS functions will be accomplished, who will be responsible for their accomplishment, and how and when they will be accomplished.

The Proposed 4000.XX Instruction establishes the NAVORD ILS/MIS (Integrated Logistic Support/Management Information System). This instruction envisions a Management Information System which records and tracks major ILS milestones, contained in the milestone section of the ILS Plan, and provides

a summary of the ILS requirements for weapons systems/ equipments.

This system is designed to record, track, and report on the status of the ILS milestone data. All NAVORD Systems, except expendable ordnance (missiles, torpedoes, mines, etc.), will be incorporated in the ILS/MIS beginning with Full Scale Development through phase out. Expendable Ordnance will be incorporated in the ILS/MIS only for the Full Scale Development Phase.

The information/data flow for this system begins when the ILS Manager transmits the milestone information to Ordnance Maintenance Management Information Center (OMMIC), Concord, California which is the central computer facility for NAVORD. Quarterly and annual reports showing the ILS milestones and planned, estimated or actual dates for the milestones are produced by OMMIC for various DOD agencies. Variance reports by the ILS Manager are used to update the milestone data.

II. ILS MANAGEMENT APPROACH - INFORMATION REQUIREMENTS

At the 1964 Spring Joint Computer Conference the following functional definition of an "ideal" Management Information System was presented by James C. Miller of Arthur D. Little, Inc.:

> "An ideal Management Information System...would...do these things:
>
> 1. Provide each level and position of management with all the information that can be used in the conduct of each manager's job.
> 2. Filter the information so that each level and position of management actually receives only the information it can and must act on.
> 3. Provide information to the manager only when action is possible and appropriate.
> 4. Provide any form of analysis, data, or information whenever it is requested.
> 5. Always provide information that is up to date.
> 6. Provide information in a form that is easily understood and digested by the manager." [9]

More directly related to Integrated Logistic Support, Secretary of the Navy Instruction 4000.29A states the following requirements:

> "Management Information Systems shall provide data to monitor the performance of the Integrated Logistic Support System and provide data to generate refinements and improvements." [10]

Department of Defense Directive 5000.1 states the following:

> "Management information/program control requirements shall provide information which is essential to effective management control. Such information should be generated from data actually utilized by contractor operating personnel and provided in summarized form for successively higher level management and monitoring requirements."[11]

This thesis, in utilizing Miller's concept of an "ideal" Management Information System, will use the following definition:

> "A Management Information System is a collection of procedures, equipment, and persons associated together for the purpose of providing managers, who have the authority to make decisions that commit the firm or its resources, with descriptions of the elements relevant to the performance of their function." [12]

Within the boundaries of this definition there must be a methodology for determining information[3] content and form required by managers for decision making.

A. MILLER's CONCEPTUAL MODEL

Miller provided the steps in Tables II-I and II-II as a conceptual model to be used in determining information requirements for Management Information System Design.

Steps one through four of Table II-I are used to obtain System Objectives. The provide a macroscopic view of whatever system is being analyzed. After completing the given steps, the procedures in Table II-II are used to develop the information requirements within the established objectives. The steps listed in Table II-I and a modified version of Table II-II will be used in this thesis to develop the information requirements for the Maintenance Planning

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[3]The term "data" and "information" will be differented in this thesis where data will refer to unprocessed as opposed to processed information. The processed information is considered to be that which is presented in a form that can be directly used for decision making.

1. State the key operations.

2. Arrange in flowchart format.

3. Provide meaning to each name on the flowchart.

4. Carefully delineate each operation.

    a. Input/output statement.

    b. Description of suboperations contained within the major operation.

Table II-I. System Objectives

1. Determine managerial actions involved in each operation.

2. Establish a list of resources involved in the managerial actions.

3. Consider the result of each managerial action.

4. Perform an analysis to determine a method to measure each managerial action, each result and each connection between actions and results. This will define the information requirements.

Table II-II. Determining Information Requirements

Integrated Logistic Support (ILS) Element. This will provide guidelines which can be used subsequently to develop information flows for the other elements.

B. MAINTENANCE PLANNING MODEL

The first step of Table II-I is to "State the key operations." Relative to the Maintenance Planning ILS Element,

the key operations may vary depending on the reference source used. In 1968 the Department of Defense promulgated the Integrated Logistic Support Planning Guide for DOD Systems and Equipment (4100.35-G) to provide common interpretation and implementation of the concepts expressed in DOD Directive 4100.35. It also indicated, in narrative and graphic form, the relationships of ILS functions with the System Life Cycle. For example, the following tasks are listed for the Maintenance Planning element for the specified Life Cycle Phase:

Concept Formulation

1. Prepare maintenance planning portion of logistic support capabilities estimate
2. Evaluate possible maintenance concepts
3. Establish maintenance concepts
4. Develop maintenance plan requirements

Contract Definition

5. Establish maintenance evaluation criteria
6. Evaluate proposed Maintenance Plan
7. Approve Maintenance Plan

Development

8. Conduct Maintenance Engineering Analysis
9. Evaluate maintenance demonstration of prototype
10. Update Maintenance Plan

Production

11. Conduct Maintenance Support Demonstration and Evaluation

12. Present Maintenance Plan to user
13. Identify and analyze support deficiencies
14. Update Maintenance Plan [13].

In 1969, the Logistics Support Directorate of the Naval Ship Missile Systems Engineering Station (NSMSES), using Department of Defense Directive 4100.35 and the ILS Planning Guide (4100.35-G) as references, promulgated an Integrated Logistics Support Handbook. The Maintenance Planning ILS Element tasks (including maintainability and reliability) during the System Life Cycle as listed in the NSMSES Handbook are as follows:

Concept Formulation

1. Prepare maintenance planning and maintainability requirements Proposed Technical Approach (PTA) input (feasibility and alternatives).
2. Expand maintenance planning and maintainability requirements concept based on Proposed Technical Approach/Specific Operational Requirement (SOR).
3. Prepare maintenance planning and maintainability requirements Technical Development Plan (TDP) input.

Contract Definition

4. Provide maintenance planning and maintainability requirements input to Logistics Support Plan.
5. Provide maintenance planning and maintainability requirements support for contract definition

proposal evaluation.

6. Provide maintenance planning and maintainability requirements support for Engineering Development evaluation.
7. Update maintenance planning and maintainability requirements.

Development

8. Conduct in process review of Maintenance Engineering Analysis/maintainability and reliability allocations to guide and approve contractor action.
9. Participate in demonstrations and evaluate maintenance support and maintainability and reliability attainment.
10. Update Maintenance Plan to production configuration and monitor maintenance resource acquisition.

Production

11. Participate in service test, evaluate maintainability and reliability demonstration and conduct maintenance planning evaluation.
12. Validate/update maintainability and reliability goals and maintenance planning for modification and subsequent systems.
13. Provide Maintenance Plan for user. [14]

It is interesting to note in the NSMSES Handbook the emphasis toward satisfying various requirements documents

such as Proposed Technical Approach, Specific Operational Requirements, Technical Development Plan and Logistic Support Plan. This might lead the reader to believe that a Management Information System could be developed by determining the requirements for each of the documents listed and providing the data needed to develop the required information. The primary reason this is not a viable approach is that the documents listed are generally broad in scope and therefore not sufficiently definitive for management information design.

This thesis will use parts from both of the lists presented but will omit the iterative (update) functions from the Management Information Model since the information requirements for a task and an update of the task are the same.

1. Key Operations

The key operations to be used in this thesis for maintenance planning management information requirements determination are as listed below:

a. Conceptual Phase

Maintenance Planning Sequence

(1) Mission Analysis

(2) Operational Analysis

(3) Environmental Analysis

(4) Plan for Use

(5) Overall Navy Logistics Constraints

(5a) Overall Navy Policy

(6) NAVMAT/SYSCOM Maintenance Policies

(7) System Logistic Concept Analysis

(8) System Maintenance Concept Analysis

(8a) System Supply Support Concept Analysis

(9) Plan for Support

b. Advanced Development Phase

(10) Preliminary R/M/A Analysis

(11) Preliminary Maintenance Engineering Analysis

(11a) Preliminary Supply Support Analysis

(12) Preliminary Plans for Maintenance

(13) ILS Plan

c. Engineering Development Phase

(14) Detailed R/M/A Analysis

(15) Detailed Maintenance Engineering Analysis

(15a) Detailed Supply Support Analysis

(16) Maintenance Demonstration and Test

(17) Detailed ILS Specifications

Operations (8a, 11a, 12a, and 15a) identify the parallel effort between Maintenance Support and Supply Support develment. This parallel development provides requisite input data for the "Plan for Use," "Plan for Support," "ILS Plan," and "Detailed ILS Specifications" and are representative of the interactions which must occur throughout the Life Cycle Development. These interactions, not only between Maintenance Planning and Supply Support, but also between Maintenance Planning and other ILS Elements will be addressed

but will not be developed since they are beyond the scope of this thesis. The Production and Operation Phases are not included since the maintenance planning activity during these phases is primarily one of feedback and update functions rather than basic development. The information flow requirements are refined rather than created.

The activity involved in developing input/output data and in describing the suboperations of each key operation requires the use of tables and codes for ease of understanding. These are contained in the next section and in Appendices A and B.

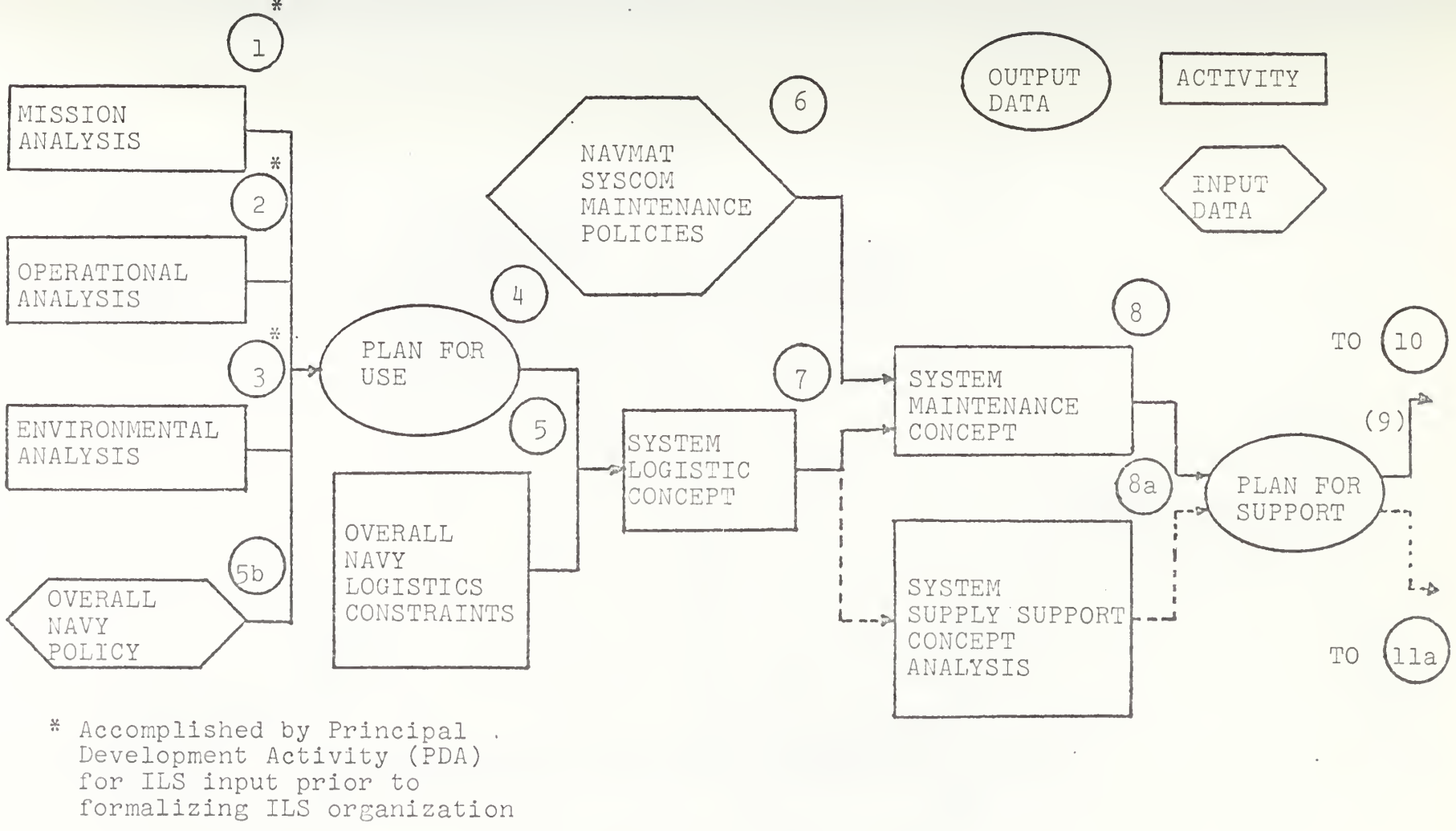
III. INFORMATION DEVELOPMENT

A. PRESENTATION METHODS

This section of the thesis develops the information flows for the key operations. These are shown on Figures 3a, 3b and 3c. The flows are presented in the form of input and output lists which show the source (input) or destination (output) and form/units for each data element listed.

Tables III-I and III-II identify the codes used on the input/output lists to indicate the source or destination of each data element. The number listed for the key operations on Table III-I correlate with the block numbers on Figures 3a, 3b, and 3c. On Table III-II, the single alphabetic characters with underlining indicate principal interface disciplines including hardware design. Double alphabetic characters without underlining identify the other ILS elements. Single alphabetic characters without underlining refer to the specific phases of system design. Block 11 of Figure 3b identifies Maintenance Engineering Analysis (MEA) which is documented by Worksheets I through IX of OR-30. Data flowing to or from the MEA are identified to the specific worksheet as 11-I, 11-II, ... 11-IX.

The input/output data lists have been placed in Appendix A and are referenced by the block number listed with each sub-section title.



* Accomplished by Principal Development Activity (PDA) for ILS input prior to formalizing ILS organization

Figure 3a. Conceptual Phase

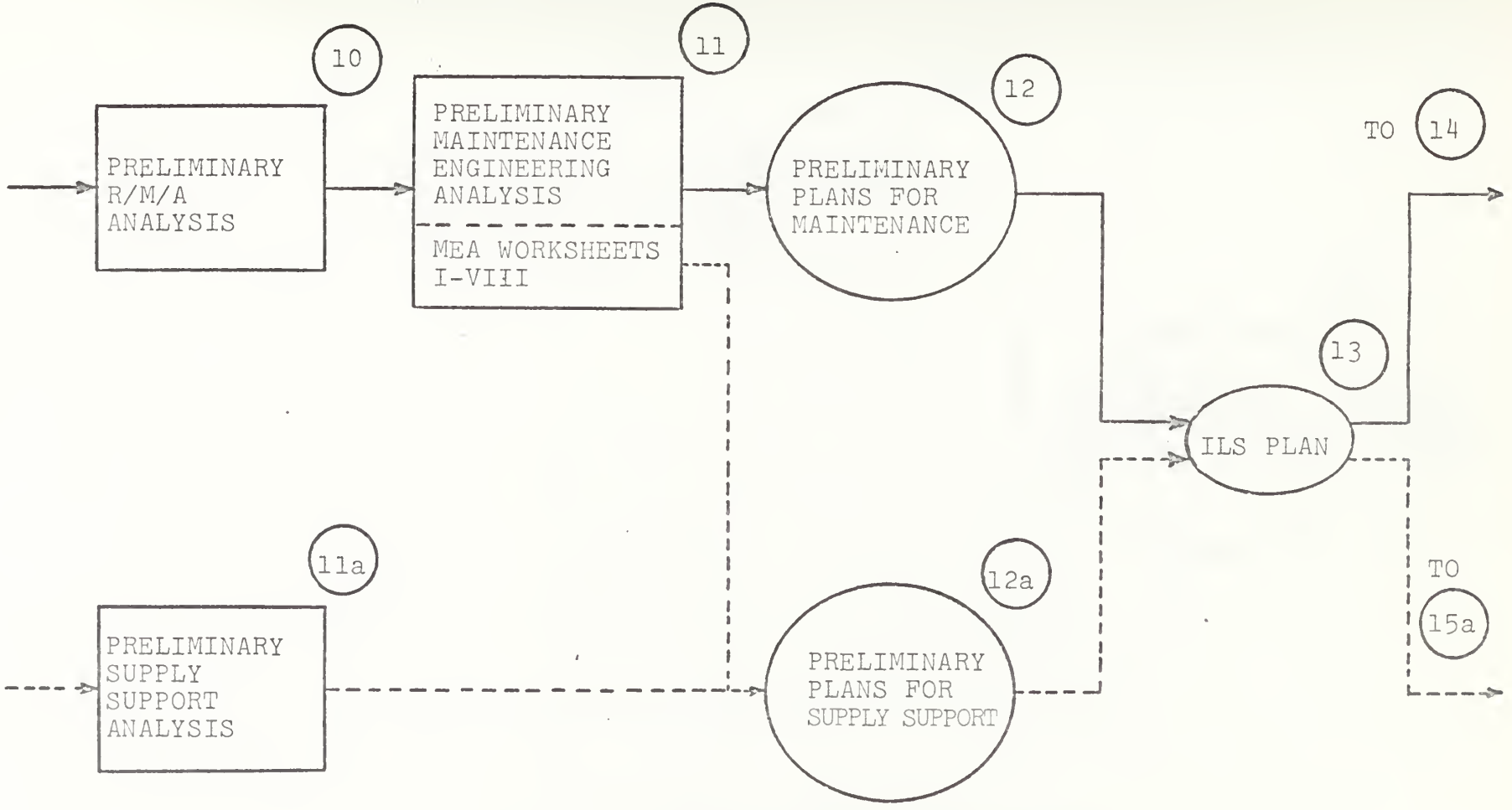


Figure 3b. Advanced Development Stage

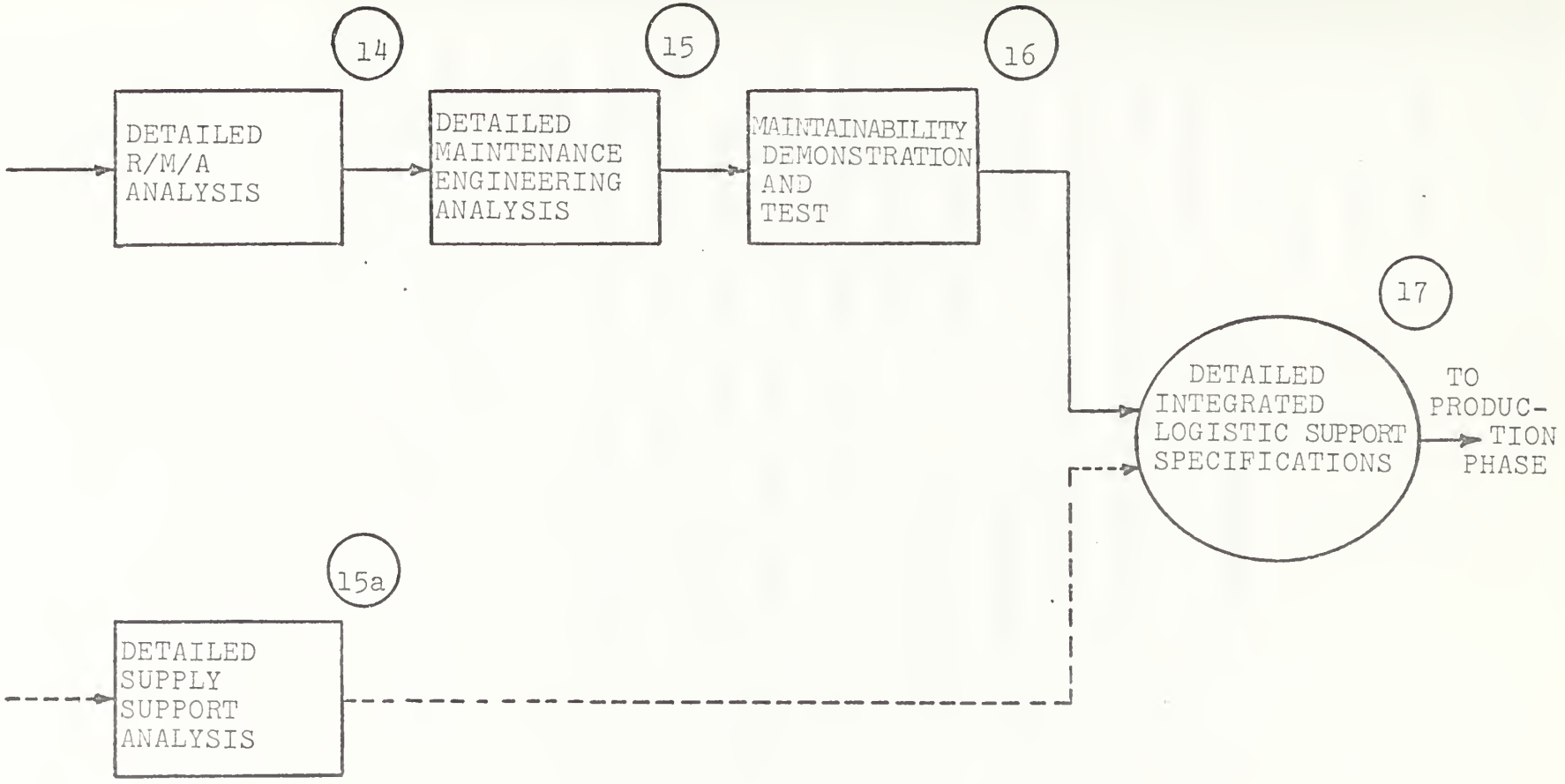


Figure 3c. Engineering Development Phase

Maintenance Planning Sequence

(1) Mission Analysis

(2) Operational Analysis

(3) Environmental Analysis

(4) Plan for Use

(5) Overall Navy Logistics Constraints

(5a) Overall Navy Policy

(6) NAVMAT/SYSCOM Maintenance Policies

(7) System Logistic Concept Analysis

(8) System Maintenance Concept Analysis

(8a) System Supply Support Concept Analysis

(9) Plan for Support

(10) Preliminary R/M/A Analysis

(11) Preliminary Maintenance Engineering Analysis

(11a) Preliminary Supply Support Analysis

(12) Preliminary Plans for Maintenance

(12a) Preliminary Plans for Supply Support

(13) ILS Plan

(14) Detailed R/M/A Analysis

(15) Detailed Maintenance Engineering Analysis

(16) Maintenance Demonstration and Test

(17) Detailed ILS Specifications

Table III-I. Key Code List

KEY CODE LIST

Interface Disciplines	Other ILS Elements
Reliability (R)	Support and Test Equipment (SE)
Maintainability (M)	Supply Support (SS)
Human Factors (H)	Transportation and Handling (TH)
Safety Engineering (S)	Technical Data (TD)
Configuration Management (C)	Facilities (FA)
Standardization (Z)	Personnel and Training (PT)
Equipment Design (E)	Logistic Support Funds (LF)

MAINTENANCE ENGINEERING ANALYSIS WORKSHEETS

I. Maintenance Engineering Analysis Summary

II. Reliability Data

III. Maintainability and Maintenance Concept

IV. Maintenance Task Analysis

V. Logistic Support Personnel Summary

VI. Support Equipment Requirements

VII. Maintenance and Support Facility Summary

VIII. Technical Data Summary

IX. Provisioning List and Design Change Notice

DESIGN PHASES

Preliminary Design (A)	Test and Evaluation (C)
Detail Design (B)	Production Design (D)

Table III-II. Key Code List

Appendix B is a matrix which contains an alphabetic list of all data elements showing their source or destination by block numbers. Sources or destinations which are not graphically displayed on Figures 3a, 3b or 3c are collected in the "0" column.

The concept followed in developing the information flows was to utilize Maintenance Engineering Analysis as a focal point since the worksheets require explicit data or information. Where narrative information was required, the author endeavored to provide data elements within the input/output flow to support the narrative.

The output requirements of the MEA identified decision needs which in turn dictated input data requirements with the only difficulty being the source of the data. After establishing this network the various supporting key operations were examined for their output requirements based on various Department of Defense directives and instructions as well as output to satisfy the function of the key operation itself.

B. ARRANGE IN FLOWCHART FORMAT

Step two of the Conceptual Model (Table II-I) states that the key operations should be arranged in flowchart format. This is accomplished for the Maintenance Planning element in Figures 3a, 3b and 3c for the Conceptual, Advanced Development, and Engineering Development Phases, respectively.

C. PROVIDE MEANING AND DELINEATE EACH OPERATION

The next two steps in the Conceptual Model are to provide meaning to each key operation on the flowchart and to delineate each operation with input/output statements and description of suboperations.

The flowcharts depict the developmental process for the Maintenance Planning ILS Element. They do not show the complete System Life Cycle; for example, the activity preceding the Mission and Support Profile Analysis is not shown nor are the Production and Operational Phases. The initial activity in a weapon System Life Cycle is concerned with defining the military needs to satisfy existing or projected threats. Threat analysis and needs determination should preferably be accomplished in an environment which is relatively free of constraints, including logistics oriented ones. The logistics parameters ideally therefore, do not become involved in the process until the mission and operational analysis is conducted.

1. Mission and Operational Analysis (Blocks 1 and 2)

As shown on Figure 3a, logistic support analysis[4] begins with the description of mission and operational parameters. This activity is inherent in the "User-Producer" dialogue described in Part I where the user identifies needs

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[4]The term "logistic support analysis" used in the context of this thesis refers to the developmental cycle shown on Figures 3a, 3b and 3c. Except where specifically identified it should not be confused with the analytical technique described in Proposed MIL-STD-1388.

and mission and operational objectives, as well as constraints. Information requirements can be determined by analyzing the primary requirements documents and management decisions involved therein. For example, the Specific Operational Requirement (SOR) Document provided to the Material Command Principal Development Activity (PDA) should contain the following: anticipated mission length, expected durations of operating periods, planned utilization rates, desired turn-around times, maintenance criteria, required shelf life, allowable down times for scheduled maintenance and test and checkout requirements.[5]

The mission and operational profiles, developed from this information provide system design objectives and parameters which, in turn, constrain maintenance policies and procedures.

Figure 4 illustrates a typical system mission profile, corresponding to a replenishment-at-sea operation. From this profile the active, alert, reaction and mission times are readily discernible. The standby period of one hour constrains preventive maintenance that may be accomplished during this period since the system must be able to become fully operational within sixty minutes.[6]

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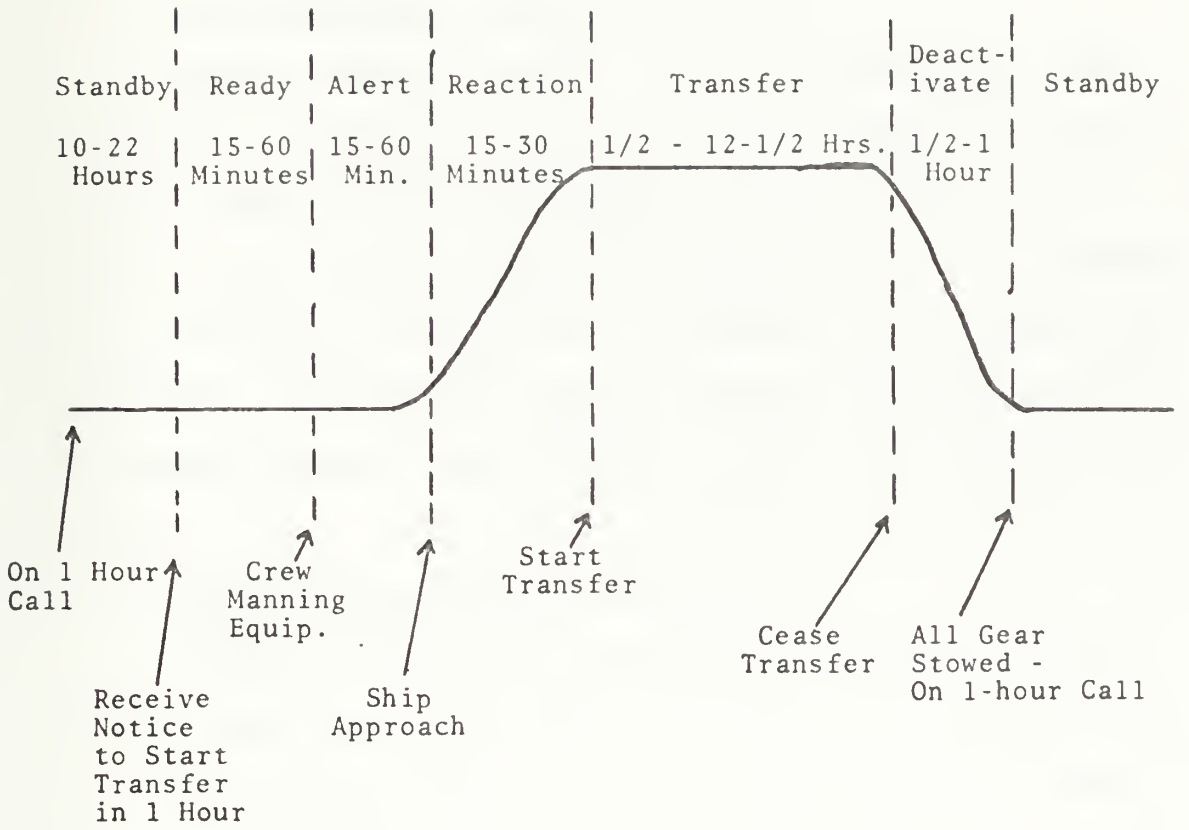
[5]Chief of Naval Material Instruction 4000.20A, Integrated Logistic Support Planning Policy, p. 45, 18 March 1971.

[6]Kline, M.B., Notes on Integrated Logistic Support, p. 15, September 1970.



(Source: Reference 6)

Figure 4. System Mission Profile

An operational profile shows the ship and equipment operational requirements during underway periods as well as the ship's active status during an operational cycle (normally time between overhauls).

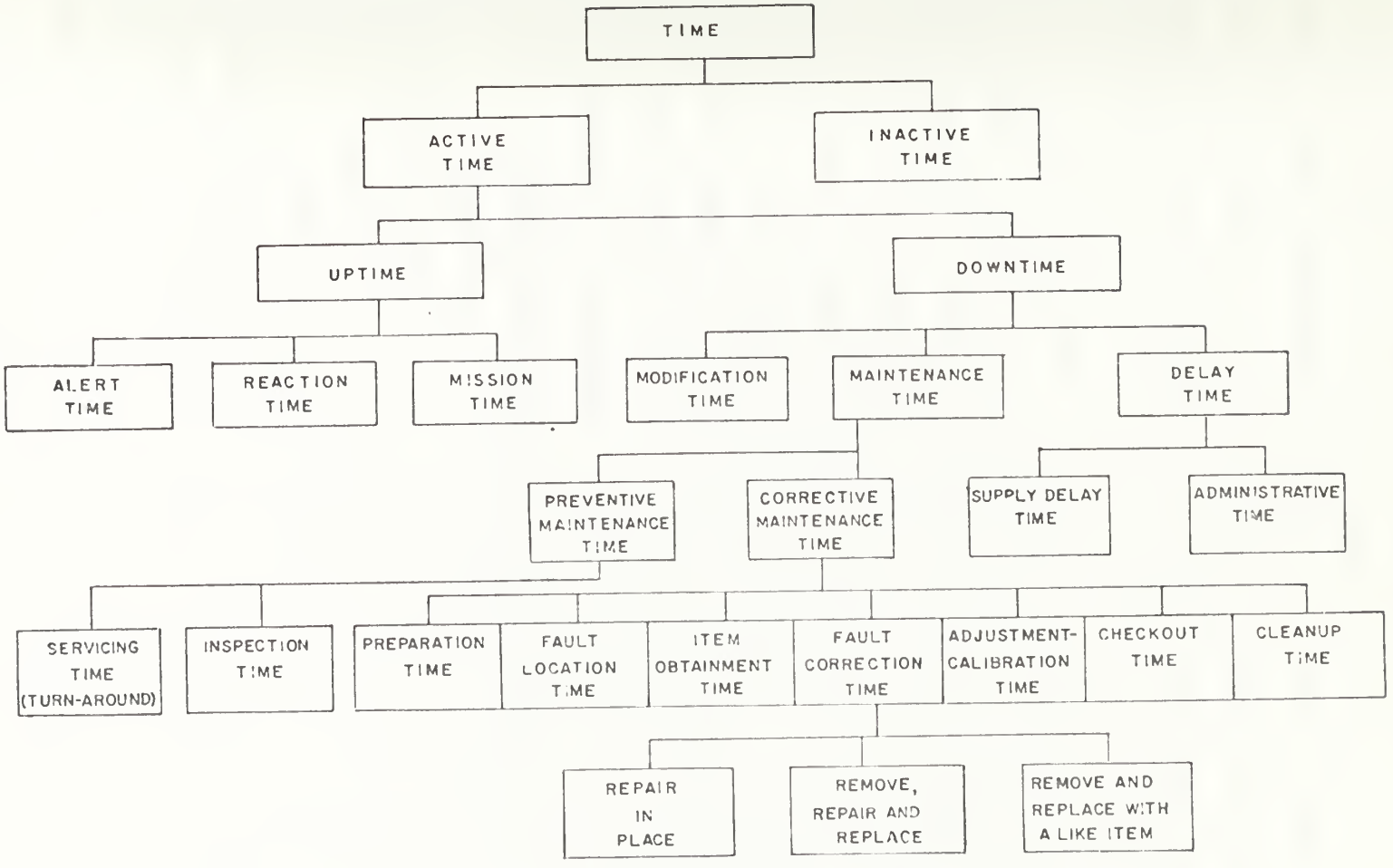
From these two types of profiles, the time factors required for various ILS analyses can be obtained. Time relationships are shown on Figure 5 and described in MIL-STD-721B.

2. Environmental Analysis (Block 3)

Environmental Analysis includes identifying such constraints as may be applied by DOD and other government sources, physical characteristics (weight, volume, size center of gravity), natural environment (vibration, temperature, sea state), human factors, safety, and equipment survivability. Constraints derived from an analysis of this information impact system design as well as the maintenance concept.

3. Overall Navy Policy (Block 5b)

Overall Navy Policy provides constraints relative to fleet operations, manpower utilization, system cnnfiguration, environmental impact guidance, and functional compatibility. Importance classification and security restrictions, determined from the SOR are also included in this block as well as those policies or constraints which cannot be classified as specific logistic policies or constraints. Specific Navy logistic constraints are included in Block 5.



(Source: Reference 15)

Figure 5. Time Relationship

4. Plan for Use

The "Plan for Use" is defined in various instructions as being collectively composed of the mission and operational parameters. These parameters include the mission and operational profile data previously indicated, mission time factors and utilization concepts, system effectiveness and goals and System Life Cycle description [16].

The "Plan for Use" should provide a Life Cycle Scenario showing the expected system life and major maintenance periods (tender availability (TAV), regular overhaul (ROH), and Modernization Cycle) as well as the major operational periods such as system deployment, mission time factors and operational environment factors. In addition, the expected degree of effectiveness in meeting the mission requirements must be specified for subsequent allocation to subsystems and equipments during design and development.

5. Overall Navy Logistics Constraints (Block 5)

In addition to the constraints included in the Environmental Analysis and overall Navy policy there are Navy logistics policy constraints which must be considered prior to establishing the system logistic concept. These logistic constraints are due to the unique operating, maintenance, and support environments for Navy systems and to the procurement, operational and logistic support procedures within the Navy. An example of these constraints is the extent of the self-sufficiency requirement while underway

during some specified operational period or the system readiness requirements in port, both of which impact Maintenance Planning.

6. NAVMAT/SYSCOM Maintenance Policies (Block 6)

Policies and procedures which are promulgated within the Naval Material Command by NAVMAT or the Systems Commands are grouped in this block for analysis. The requirements and constraints identified may range from maintenance level limitations to configuration management policy. One of the primary methods of obtaining this information is to conduct a thorough review of all policy directives and instructions relating to the specific ILS Element. For example, Naval Ordnance Requirements (OR-30) promulgated by NAVORD delineates contractor/sub-contractor responsibilities in the conduct of Maintenance Engineering Analysis as part of the ILS program while NAVMAT Instruction 4000.20A specifies Life Cycle Costing policy. Some of the other documents and their application are listed on the input/output list in Appendix A.

7. System Logistic Concept (Block 7)

The System Logistic Concept is a summary of logistic considerations, concepts, constraints, and requirements from all the data-generating sources previously mentioned. From the Mission and Operational Profile Analysis and the "Plan for Use," logistic endurance factors are determined. These factors identify when and what logistic support activities may occur.

Figure 3a identifies this block as the point of initial division of the logistic support analysis into activities of Maintenance and Supply Support Planning. The supply support stream shown by the dotted-lines is used to illustrate the parallel development and interfacing requirements of the two concepts but is not developed as part of this thesis.

8. System Maintenance Concept (Block 8)

Maintenance Concepts are the "planned or envisioned methods that are to be employed for maintaining the system/equipment in a specified condition. This term includes the type of maintenance, levels of maintenance, frequency, and the physical location(s) of maintenance activity." [17]

A review of other Defense Department directives and instructions identify the following as outputs of the Maintenance Concept Analysis in addition to the functions in the last paragraph: fault isolation and systems testing approach, equipment overhaul approach, component repair by maintenance level, and scheduled maintenance requirements.

These requirements must be scrutinized carefully for context in light of the information that is available. First of all, at this point in the life cycle, the analysis is conceptual and is accomplished at the system or subsystem level vice equipment or component level.

Type of Maintenance refers to whether the maintenance action is inspect, test, disassemble, repair, or replace or other associated activity.

Levels of Maintenance refers to the different echelons of maintenance accomplishment known as organizational, intermediate, and depot. The level for the performance of maintenance is determined by the complexity of the maintenance requirement and the support equipment needed to accomplish it. The Organizational Level is normally the operational unit (ship, submarine, aircraft) that uses the system. Intermediate activities are normally Tenders or other floating repair Ships, or certain shore stations as Naval Air Rework Facilities (NARF) and Naval Weapons Stations (NWS). Depot repair is the highest form of maintenance level attainable and may be the contractor's plant, a shipyard, or other shore activity such as a Naval Ammunition Depot.

The Maintenance Concept derived from the Mission and Operational Profile Analysis as constrained by environmental and Navy system constraints and policies, may result in the following relative to maintenance levels:

1. No maintenance accomplished at organizational level.
2. System testing only at organizational level.
3. Modular replacement only at organizational level.
4. Modular repair at intermediate (or depot) activity.
5. Major overhaul at depot (or contractor) facility.
6. Maintenance activities construction requirements and location.

More detailed analyses to develop specific lower level maintenance concepts are performed as part of the

Maintenance Engineering Analysis (MEA) during the Engineering Development Phase. The detailed MEAs will result in identifying the maintenance level for each repairable component and the locations of activities performing the maintenance.

Fault Isolation and Systems Test concept should identify the requirement for automated fault isolation systems, built in test equipment, and general-purpose or specialized equipment in this area.

The Equipment Overhaul approach may specify overhaul at the contractor's facility on some predicted cycle, overhaul with the platform at a Naval shipyard, removal and overhaul at some other depot level activity or replacement in lieu of overhaul.

Component Repair by Maintenance Level is determined from existing repair/discard criteria or a Level of Repair (LOR) Analysis. NAVMATINST 4000.20A states the Level of Repair Analysis is an analytical technique which "establishes the organizational location at which each piece of hardware...is repaired or replaced."[7] This reference also indicates that the LOR Analysis itself costs about $150 per replaceable module.[8] Repair/discard models have been developed based on contributing cost factors, such as the cost of entering a new item in the Navy Supply System,

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[7]CNM INST 4000.20A, op. cit.

[8]Ibid.

personnel costs, transportation costs, facilities cost, etc., which can be used analytically to establish repair/discard decision criteria.

Scheduled Maintenance Requirements analysis provides the concepts relative to the preventive maintenance program. For example, the policies may include:

1. Maintenance in accordance with Navy 3M System.
2. Maintenance performed only during condition III readiness status.
3. Maintenance not to interfere with system operation during mission.
4. Preventive maintenance will be performed in port only.

Frequency of maintenance and Facility Location require no amplification.

9. Plan for Support (Block 9)

The System Maintenance Concept together with the System Supply Support Concept constitute the "Plan for Support." The Plan for Support is also the initial interfacing document between the Integrated Logistic Support effort and the Design or Systems Engineering effort. Material provided in the Plan for Support can lead to the Development of Design Criteria for Logistics Elements (DCLE)[9] which may be used as a forcing function for hardware design.

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[9]Kline, op. cit.

10. Preliminary Reliability/Maintainability/Availability Analysis (Block 10)

This function involves the analysis of established R/M/A goals and other factors impacting reliability, maintainability, and availability to establish trade-off criteria relative to effectiveness, cost, and schedule trade-offs. End item reliability goals may then be apportioned to lower level assemblies down to the nonrepairable item level to be used for maintainability prediction for both scheduled and unscheduled maintenance. Maintainability design concepts consistent with the "Plan for Use" can then be developed.

11. Maintenance Engineering Analysis (Block 11)

Maintenance Engineering Analysis (MEA) is defined as

> "A process by which persons with specialized experience in the area of maintenance examine the actual or proposed design of a system/equipment to identify and/or propose characteristics by which the required logistic resources are identified."[10]

It is the core of transforming operational and logistic support concepts and requirements into hardware "design-to" specifications.

This Analysis generates data and information which are documented, in the case of NAVORD, on the MEA Worksheets listed in Table III-II. The assembled worksheets then

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[10]Naval Ordnance Systems Command OR-30, Integrated Logistic Support Program Requirements, p. 5, 3 March 1969.

constitute the Maintenance Engineering Analysis Record or "Plan for Maintenance." By virtue of analyzing the MEA Worksheets, the requirements to provide the needed input data or information are easily determined. Descriptions of each worksheet and the required input and output data are presented in order.

Much of the information required in these worksheets will not be available for the Preliminary MEA (key operation 11) but will be picked up in the Detailed MEA (key operation 15). This is differentiated by the use of asterisks as shown on the data sheets, Appendix A.

a. MEA Worksheet I - Maintenance Engineering Analysis Summary

The Maintenance Engineering Analysis Summary identifies all maintenance requirements applicable to an item to be covered by a separate Maintenance Engineering Analysis Record. Worksheet I summarizes and is an index to the other worksheets; therefore, the large majority of data or information elements are derived from the other worksheets.

b. MEA Worksheet II - Reliability Data

Worksheet II is used to provide reliability data on proposed systems as well as on operational systems being provided as Government Furnished Equipment (GFE) for newly designed hardware the documentation is derived from an engineering analysis or from operating reliability data where it exists.

c. MEA Worksheet III - Maintainability and Maintenance Concept

This worksheet provides a narrative description of the item maintenance plan and justification for assignment of maintenance requirements and tasks to the various levels of maintenance (organizational, intermediate or depot). In addition, maintainability design criteria in the form of mean-time-to-repair (MTTR) goals and maintenance requirement criticality is addressed.

Where the worksheets indicate the requirement for a "narrative" treatment on the subject, the author has endeavored to provide data elements or information inputs and outputs to support the narrative requirement. This can be seen on Worksheet III input/output sheets where both the maintenance plan and the justification have been subdivided.

d. MEA Worksheet IV - Maintenance Task Analysis

The purpose of this analysis is to "describe the procedure and to identify and establish skill levels and task time for performing each task involved in accomplishing the individual maintenance requirements pertaining to the item."[11]

The analysis involves determining the best method for accomplishing the maintenance requirement. Tools, test equipment, support equipment, personnel resources, and

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[11] Ibid., p. B-21.

technical data required to perform the maintenance are also identified. In addition, safety precautions and human factors data are identified or developed.

A separate Worksheet IV should be completed for each maintenance requirement identified with the item examined.[12] The Maintenance Identification Code (Worksheet block 4) is the common thread used throughtut Worksheets IV through VIII to correlate data for a specific maintenance requirement.

e. MEA Worksheet V - Logistic Support Personnel Summary

This worksheet summarizes the Logistic Support Personnel Requirements determined as a function of maintenance requirement and task times, and skill level requirements. The personnel requirements are summarized from columnare data contained on Worksheet IV as controlled by the Maintenance Identification Code. These codes should be organized by maintenance level to facilitate quantification.[13]

f. MEA Worksheet VI - Support Equipment Requirements Sheet

The purpose of this worksheet is to provide the technical data needed for the acquisition of support equipment required to support the maintenance requirements and

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[12] Ibid.

[13] Ibid. p. B-27.

tasks of the item in question. The form used for Worksheet VI is a detailed pre-printed form and contains instructions for completion. OR-30 modifies the instructions slightly as can be seen by a comparison of the input/output data sheets and the worksheet in OR-30.

g. MEA Worksheet VII - Maintenance and Support Facility Summary

Tnis worksheet describes the nature of the facilities as a function of the task analysis documented on Worksheet IV. Where the requirement for a maintenance or support facility is indicated in block 6 of Worksheet IV, Worksheet VII must be developed.

The input/output data sheet lists the data elements derived to support both the facility functional analysis and the facility design criteria both of which are outputs in narrative form. The facilities criteria are merely an indication of the type of data that should be generated and transmitted to the Facilities ILS Manager.

h. MEA Worksheet VIII - Technical Data Summary

The purpose of this worksheet is to summarize the kinds of technical data necessary in the accomplishment of each maintenance requirement. This form is a summary form which identifies the data for each specific Maintenance Identification Code. As seen in the output data sheet, the data identified is categorized as technical manuals, maintenance requirement cards, engineering drawings and calibration criteria.

i. MEA Worksheet IXA and IXB

These worksheets have not been included because they are standard preprinted forms relating to provisioning technical documentation and thus form part of the supply support element information flow. MIL-P-21873 can be consulted for specifics.

12. Preliminary Plan for Maintenance (Block 12)

The Preliminary Plan for Maintenance essentially consists of the combined documentation of the Preliminary Maintenance Engineering Analyses. It provides a technical data base for subsequent and detailed development of logistic support analysis and to drive the system/equipment hardware design with respect to reliability and maintainability requirements. The contents of this plan should include the Maintenance Concept, reliability and maintainability design data (criticality, operational endurance factors, MTBF, MTTR), maintenance requirements and tasks documented in Worksheet IV, and logistic support resource requirements to the depth known. Since the Plan for Maintenance is an end product which is an input to the ILS Plan, the only data element sheet in Appendix B for this block is an input data sheet.

13. Integrated Logistic Support Plan (Block 13)

The data identified for the Integrated Logistic Support Plan was primarily derived from NAVMAT and NAVORD instructions and represents a broad treatment of the data which has been presented previous to this. OR-30 identifies

six major sections for the ILS Plan as follows: (1) Introduction, (2) System Description Summary, (3) Base Line Support Plan (Plan for Support), (4) Navy/Contractor ILS Planning Process, (5) Contractual ILS Plan, and (6) Summary of Contractual Plans Related to ILS Planning Process.[14] OR-30 uses twenty-one pages to list specific requirements for the ILS Plan. The input data sheet for block 13 in Appendix A identifies only that data which is related to the Maintenance Planning element.

14. Detailed Reliability/Maintainability/Availability Analysis (Block 14)

The Detailed Reliability/Maintainability/Availability Analysis is primarily concerned with continuation of the R/M/A Analysis started in block 10 with a more detailed analysis of system/equipment design to insure that the R/M/A design criteria are met. Drawings are reviewed relative to goals established in the Preliminary R/M/A Analysis or subsequent modification. More detailed R/M/A predictions are made and goals are then apportioned to the lower assembly levels correlative with hardware design. R/M/A verification and assurance programs are developed as part of this analysis.

15. Detailed Maintenance Engineering Analysis (Block 15)

There are no input/output sheets in Appendix B for this block since the same MEA worksheets identified for

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[14] Ibid., p. A-1.

block 11 will apply. The difference is that data which was not available for the Preliminary MEA, as indicated on the input/output data sheets by an asterisk, should now be available in the Engineering Development Phase.

16. Maintainability Demonstration and Test (Block 16)

This block includes all the supporting elements needed to establish detailed test plans. The data elements and information requirements were derived from MIL-STD-471 which provides for qualitative assessment of various support factors in relation to item downtime in addition to the quantitative maintainability assessment. The data elements listed on the input data sheets indicate the contractor and project office as sources for the data. This is due to the nature of the decision required, i.e. such information as test team organization, facility test requirements, and demonstration report requirements are not determined from analysis by the logistic element managers. The output data is data required in the test/demonstration report [18].

17. Detailed ILS Specifications (Block 18)

The detailed Integrated Logistics Support Specifications represent the final output of the ILS development process for each of the ILS elements. These specifications not only include an updated Integrated Logistic Support Plan, but also identify the availability of each Logistic Support Element for the Operational Phase of the System Life Cycle. These specifications should include a detailed plan for validation and check-out of each logistic support

function identified in the ILS Plan. Since it is primarily used to provide for validation of all the various ILS element and interface program plans contained in the ILS Plan, the data flows are not indicated.

IV. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Critical decision-making in today's managerial world has created the need for a significant increase in the capability for information processing, both qualitatively and quantitatively. This thesis has provided a model for improvement in information processing for Integrated Logistic Support. Specifically, the model is used for development of information requirements and data elements for the Naval Ordnance Systems Command. In order to illustrate the methodology and degree of detail needed for development, one ILS Element (Maintenance Planning) was presented.

Maintenance Planning must begin in the Conceptual Phase of the System Life Cycle and continue through the succeeding acquisition phases. A flowchart covering these phases was developed to establish the framework for the information flow. A conceptual model for developing information requirements for a Management Information System was used as a tool in developing the information flow network, specifically, the first four steps of the model, which identified procedures for developing the key operations, flowchart and management functions within each key operation, were followed explicitly. The remaining four steps (Table III-II) were modified for use because of the thesis orientation to one ILS Element.

Input/output data sheets were developed for each block (key operation) in the flow network to show each data element, its source or destination, and the form or units involved.

In the development of the information flows contained in Section III, the Maintenance Engineering Analysis Data Sheets specified by NAVORD OR-30 were used. Input data elements were identified based on an analysis of the functional requirements and the output data required for each worksheet. The required input data elements were then traced back to a logical source, an output from a previous analysis or a requirements document. Thus the MEA and the process of "tracing back" the data requirements created the major portion of the information network. Information requirements and data elements were then put into an alphabetic matrix form (Appendix B) to show all input and output flow activity for each ILS Element.

In addition to the Maintenance Engineering Analysis specified by OR-30 there is a similar analytical technique called Logistic Support Analysis (LSA) which is planned for implementation within the Naval Material Command. During the development of this thesis the status of the proposed Military Standard defining the LSA Process (MIL-STD-1388) was indefinite and there were indications of major revisions. However, the Naval Material Command (NAVMAT 042) has recently stated the MIL-STD will be officially approved and released approximately December 1973. The primary thrust of this

thesis is the same, however, regardless of the analysis method used since the information requirements are the same.

Logistic Support Analysis, as defined in NAVMAT Instruction 4000.20A, is a "three-step analytical technique for determining and achieving design characteristics of an end item...for identifying the requisite logistic resources..."[15] The system requires the use of input data sheets and provides recommended output reports which are summaries of the nine ILS elements and interfacing disciplines.

The primary differences in the two systems are the forms used and the specific identification of data elements. MIS-STD-1388 contains detailed input and output data sheets in computer format. MIL-STD-1388 Supplement, Logistic Support Analysis Proposed Data Element Definitions, lists 151 data elements with their descriptions, definitions, and computer format. A sample Maintenance Engineering Analysis Worksheet and a Logistic Support Analysis Input Data Sheet are presented in Appendix C for comparison.

The model developed in this thesis can be used as a framework to identify the data requirements for each ILS Element and interfacing disciplines. This data provides the basis for a Management Information System design. Although Appendix B lists 423 data elements for Maintenance Planning, it cannot be concluded that each of the remaining ILS Elements would generate that amount of required data.

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[15]CNMINST 4000.20A, op. cit.

There are many data elements in this thesis which interface with other ILS elements and thus would create redundant data elements. It is only in the analysis and collection of data as shown in Part III and the presentation of data elements in matrix format in Appendix B that the interfaces between the elements, and thus common data elements, are identified and redundancy eliminated.

The Alphabetic Matrix (Appendix B) also provides a method whereby the data elements identified can be compared to the standard data elements contained in the Supplement to MIL-STD-1388. This is significant in view of the planned implementation of the LSA process.

It is noteworthy that this model is applicable regardless of the decision whether to continue use of OR-30 or implement MIL-STD-1388. Since the MIL-STD-1388 Supplement contains only 151 data elements for the complete Logistic Support Analysis, and this thesis identified 423 data elements for the Maintenance Planning Element alone, MIL-STD-1388 should be analyzed prior to implementation. In the same context, if the OR-30 Maintenance Engineering Analysis is to be continued, the worksheets should be changed to computer format. This change would preclude the necessity for transcribing the data for computer processing.

This model can also be easily implemented into the NAVORD ILS/MIS Program, however, the existing ILS/MIS would require a change in scope to the level of detail specified in the information flows. As indicated in the introduction,

information processing in the past is not commensurate with the management needs of today and certainly not of the future. Analytically-developed decision criteria is a must for knowledgeable decision-making. This thesis is a step in the direction of improved information development.

MISSION ANALYSIS (Block 1)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
THREAT SCENARIO	SOR	NARRATIVE
THREAT SOURCE	"	DESCRIPTIVE
THREAT DATE	"	TIME FRAME
DESIRED CAPABILITY	"	DESCRIPTIVE
PERFORMANCE SPECIFICATIONS	SOR/TDP	DESCRIPTIVE
MISSION REQUIREMENTS	SOR	DESCRIPTIVE
MISSION PROFILE	"	GRAPHIC
MISSION TIME FACTORS	"	TIME UNITS
SYSTEM UTILIZATION RATE	"	NUMERIC
SYSTEM EFFECTIVENESS GOALS	"	"
RELIABILITY GOALS	"	"
MAINTAINABILITY GOALS	"	"
REACTION TIME	"	TIME UNITS
MAXIMUM OPERATING TIME	"	TIME UNITS

MISSION ANALYSIS (Block 1)

(OUTPUT) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
ACTIVE TIME	4/10/11-III,IV	TIME UNITS
INACTIVE TIME	" "	"
UPTIME	" "	"
DOWNTIME	4/10/11-IV	"
ALERT TIME	" "	"
REACTION TIME	" "	"
MISSION TIME	4/7/8/10/11-III,IV	"
MODIFICATION TIME	4/8/10/11-IV	"
MAINTENANCE TIME	4/8/10/11-III,IV	"
AVAILABILITY REQUIREMENTS	4/7/10/11-IV/R-A	NUMERIC (%)
DEPENDABILITY REQUIREMENTS	" "	"
MAINTAINABILITY REQUIREMENTS	4/8/10/11-III,IV/M-A	TIME UNITS
SYSTEM/SUBSYSTEM CRITICALITY	4/10/11-III,IV/R-A	RANKING
SYSTEM UTILIZATION	4/7/10/11-III	NUMERIC
SYSTEM EFFECTIVENESS GOALS	" "	"
R/M/A GOALS (ALLOCATION)	" "	"
MODERNIZATION TIME	4/10/11-IV	TIME UNITS

OPERATIONAL ANALYSIS (Block 2)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
SYSTEM OPERATIONAL STATES		
CRUISE PERIOD	TYPE CDR.	TIME UNITS
INPORT PERIOD	"	" "
OVERHAUL PERIOD	"	" "
FLEET INTRODUCTION DATE	SOR	MONTH-YEAR
IOC DATE	SOR	" "
NUMBER OF UNITS PLANNED	SOR	NUMERIC
PLANNED SYSTEM LIFE CYCLE	SOR	"
DEPLOYMENT CYCLE	CNO	DESCRIPTIVE/NUMERIC
MOBILITY REQUIREMENTS	SOR	DESCRIPTIVE
MODERNIZATION CYCLE	SOR	NUMERIC

(OUTPUT) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
UNDERWAY TIME	4/7/8/10/11-IV	TIME UNITS
INPORT TIME	4/8/11-IV,VII	" "
TENDER AVAILABILITY (TAV) CONCEPT	4/7/8/10/11-VII	DESCRIPTIVE/ SCHEDULE
SYSTEM OVERHAUL CONCEPT	4/8/10/11-VII	DESCRIPTIVE
TIME BETWEEN OVERHAUL	4/7/8/12/11-II/R-A	TIME UNITS
OPERATIONAL REQUIREMENTS	4/7/8/10/11-VII	DESCRIPTIVE
OPERATIONAL PROFILE	" "	" "
PROPOSED SERVICE LIFE	4/7/11-IV	TIME UNITS
REQUIRED QUANTITIES	4/11-VI	NUMERIC
OPERATING AREA (GEOGRAPHIC)	4/11-VII	DESCRIPTIVE
SYSTEM/EQUIPMENT DEPLOYMENT	4	DESCRIPTIVE
SYSTEM LIFE CYCLE CONCEPT	4	DESCRIPTIVE
OPERATIONAL CONCEPT	14	DESCRIPTIVE

ENVIRONMENTAL ANALYSIS (Block 3)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
PHYSICAL CONSTRAINTS		
DIMENSIONAL	SOR/TDP	SIZE
WEIGHT	"	NUMERIC
ACCESS	"	DESCRIPTIVE
RESOURCES REQUIRED (POWER/ HEAT/LIGHT)	"	"
PLATFORM TYPE (POSITION/ CENTER OF GRAVITY)	"	SHIP/AC TYPE
ENVIRONMENTAL CONSTRAINTS		
NATURAL (ALTITUDE/TEMP/ HUMIDITY/FOG/RAIN)	SOR	DESCRIPTIVE/RANGE/ NUMERIC
MOTION (VIBRATION/SHOCK)	"	"
TIME (DAY/NIGHT)	"	"
SEA CONDITIONS (SEA STATE)	"	"
QUANTITATIVE HUMAN FACTORS CONSTRAINTS	"	NUMERIC
QUALITATIVE HUMAN FACTORS CONSTRAINTS	"	DESCRIPTIVE
MINIMUM SAFETY REQUIREMENTS	"	"
ACCEPTABLE HAZARD	"	CATEGORY I-IV (MIL-STD-882)
"FAIL SAFE" CHARACTERISTICS	"	"
OPERATING ENVIRONMENT CONSTRAINTS	"	DESCRIPTIVE
SURVIVABILITY REQUIREMENTS	"	"
EMISSION CONTROL REQUIREMENTS	"	"
EMERGENCY DESTRUCTION REQUIREMENTS	"	"

ENVIRONMENTAL ANALYSIS (Block 3)

(OUTPUT) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
APPROXIMATE SIZE	E-A/TH/11-III,VII	NUMERIC
- WEIGHT	E-A/TH/11-III,VII	NUMERIC
VOLUME	" "	"
ACCESSIBILITY REQUIRED	E-A/S-A/H-A/11-III	DESCRIPTIVE
POWER REQUIREMENTS	E-A/SE/FA/11-IV,VII	"
AUXILIARY SYSTEM REQUIREMENTS	" "	"
PLATFORM APPLICATIONS	E-A/FA/SE/H-A/11-III	SHIP/AC TYPE
OPERATING ENVIRONMENT PARAMETERS	7/16	DESCRIPTIVE
EXPECTED TEMPERATURE RANGE	4/E-A	NUMERIC
" HUMIDITY RANGE	"	"
" SEA CONDITIONS	"	" (SEA STATE)
" DEGREE OF EXPOSURE	"	NUMERIC
" WIND CONDITIONS	"	RANGE IN KNOTS
" VIBRATION, SHOCK	"	DESCRIPTIVE/ NUMERIC
SAFETY DESIGN FEATURES	S-A/11-IV	DESCRIPTIVE
HUMAN COMPATIBILITY REQUIREMENTS	H-A/11-IV,V	DESCRIPTIVE
HUMAN FACTORS CONSTRAINTS	7	"
EXTERNAL ENVIRONMENTAL STRESS	10	"/NUMERIC
INTERNAL ENVIRONMENTAL STRESS	10	" "

PLAN FOR USE (Block 4)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
PERFORMANCE SPECIFICATIONS	SOR/TDP	DESCRIPTIVE
RELIABILITY GOALS	1	NUMERIC (MTBF/MTBMA)
MAINTAINABILITY GOALS	1	" (MTTR/MAMDT)
MISSION REQUIREMENTS	1	DESCRIPTIVE
MISSION TIME FACTORS	1	TIME UNITS
AVAILABILITY GOALS	1	NUMERIC
SYSTEM UTILIZATION RATE	SOR/1	DESCRIPTIVE
OPERATIONAL PROFILE	2	DESCRIPTIVE
SYSTEM LIFE CYCLE PLAN	SOR/2	"
CONFIGURATION CONSTRAINTS	5b	"
SYSTEM/EQUIPMENT DEPLOYMENT	2	" /NUMERIC
MANPOWER REQUIREMENTS	5b	NUMERIC
FUNCTIONAL COMPATIBILITY REQUIREMENTS	5b	DESCRIPTIVE
OPERATING ENVIRONMENT PARAMETERS	3	" /NUMERIC
SYSTEM/SUBSYSTEM CRITICALITY	1/TDP	"
TAV CONCEPTS	2	"
SYSTEM OVERHAUL CONCEPT	2	"
REQUIRED QUANTITIES	2	NUMERIC
MODERNIZATION TIME FACTOR	1	TIME UNITS
UNDERWAY TIME	2	" "
INPORT TIME	2	" "
TIME BETWEEN OVERHAUL	2	" "
OPERATIONAL REQUIREMENTS	2	DESCRIPTIVE

PLAN FOR USE (Block 4)

(OUTPUT) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
OPERATING ENVIRONMENT	8	DESCRIPTIVE
MISSION REQUIREMENTS	8	DESCRIPTIVE/NUMERIC
MISSION TIME FACTORS	8	TIME UNITS
SYSTEM EFFECTIVENESS REQUIREMENTS	R-A/16	DESCRIPTIVE/NUMERIC
PERFORMANCE GOALS	R-A/11-IV	NUMERIC
AVAILABILITY GOALS	R-A/M-A	"
RELIABILITY GOALS	R-A	"
MAINTAINABILITY GOALS	M-A	"
UTILIZATION RATE	E-A	"
SYSTEM LIFE CYCLE DURATION	7/8	"
" " " DEPLOYMENT	7/8	DESCRIPTIVE/CYCLE
" " " MODERNIZATION	7/8	" "
CONFIGURATION REQUIREMENTS	E-A	DESCRIPTIVE
SYSTEM OPERATIONAL MODES	E-A/M-A	"
SYSTEM OVERHAUL/TAV PLAN	7/8/11-IV	"

OVERALL NAVY LOGISTICS CONSTRAINTS (Block 5)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
SELF SUFFICIENCY REQUIREMENTS	SOR	DESCRIPTIVE
NAVY 3M SYSTEM REQUIREMENTS	OPNAV 43P2	"
PMS LIMITATIONS UNDERWAY	TYCOM	"
SPACE LIMITATIONS (WORKING)	NAVSHIPS	"
SPACE LIMITATIONS (STORAGE)	"	"
MANNING AND SKILL LEVEL CONSTRAINTS	BUPERS	DESCRIPTIVE/ NUMERIC
NAVY SUPPLY SYSTEM COMPATIBILITY	NAVSUP	DESCRIPTIVE
PROVISIONING REQUIREMENTS	NAVSUP	"
OVERHAUL CYCLE CONSTRAINTS	CNO/TYCOM	"
DEPLOYMENT REQUIREMENTS	CNO	"
OPERATING ENVIRONMENT	CNO/TYCOM	"
STABILITY REQUIREMENTS	NAVSHIPS	"
OPERATIONAL ENDURANCE	CNO	"
READINESS REQUIREMENTS IN-PORT	TYCOM	"
REDUCED MANNING IN-PORT	CNO/TYCOM	"
EQUIPMENT ACCESSIBILITY	NAVSHIPS	"
SUPPORT EQUIPMENT AVAILABILITY	NAVSUP	"

OVERALL NAVY LOGISTICS CONSTRAINTS (Block 5)

DATA/INFORMATION (OUTPUT)	(DESTINATION)	FORM/UNITS
SELF SUFFICIENCY CONSTRAINTS	7/E-A/11-IV	DESCRIPTIVE
NAVY 3M REQUIREMENTS	TD/11-IV	DESCRIPTIVE
MAINTENANCE LIMITATIONS:		
UNDERWAY PREVENTIVE MAINTENANCE	11-IV	DESCRIPTIVE
UNDERWAY CORRECTIVE MAINTENANCE	11-IV	DESCRIPTIVE
WORKING SPACE ALLOCATIONS	11-IV/E-A	GRAPHIC/NUMERIC
STORAGE SPACE ALLOCATIONS	8a/SS	GRAPHIC/NUMERIC
PERSONNEL SKILL LEVEL CONSTRAINTS	11-IV/PT	DESCRIPTIVE/NUMERIC
NAVY SUPPLY SYSTEM INTERFACE REQUIREMENTS	SS/8a	DESCRIPTIVE
PROVISIONING REQUIREMENTS	SS/TD	"
OVERHAUL CYCLE CONSTRAINTS	11-IV/10/8	DESCRIPTIVE/NUMERIC
TENDER AVAILABILITY CONSTRAINTS	11-IV/10/8	" "
MODERNIZATION PROGRAM CONSTRAINTS	11-IV/10/8	" "
DEPLOYMENT CONSTRAINTS	11-IV/10/8	" "
INSTALLATION LIMITATIONS (c.g./stability characteristics)	E-A	GRAPHIC/NUMERIC
GEOGRAPHIC OPERATIONAL CONSTRAINT	SS	DESCRIPTIVE
READINESS REQUIREMENTS - IN PORT	10/R-A/M-A	"
MANNING REQUIREMENTS - IN PORT	10/R-A/M-A	DESCRIPTIVE/NUMERIC
READINESS CONDITIONS UNDERWAY	10/R-A/M-A	DESCRIPTIVE

OVERALL NAVY POLICY (CONSTRAINTS) (Block 5b)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
QUALITATIVE MANPOWER CONSTRAINTS	BUPERS	DESCRIPTIVE
SYSTEM CONFIGURATION CONSTRAINTS	SOR	DESCRIPTIVE
IMPORTANCE CLASSIFICATION	SOR	CODE
FUNCTIONAL COMPATIBILITY CONSTRAINTS	NAVSHIPS	DESCRIPTIVE
SECURITY RESTRICTIONS	CNO/TDP	DESCRIPTIVE
PLATFORM APPLICATION POLICY	SOR	SHIP/AC TYPE
ENVIRONMENTAL IMPACT POLICY	OPNAV	DESCRIPTIVE (OPNAV 6420.2A)
LIFE CYCLE COSTING POLICY	SECNAV	DESCRIPTIVE (SECNAV 4000.31)

(OUTPUT) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
PLATFORM APPLICATION	8	SHIP/AC TYPE
SECURITY REQUIREMENTS	E-A	DESCRIPTIVE
SHOCK HARDENING REQUIREMENTS	"	"
EMERGENCY DESTRUCTION "	"	"
EMISSION CONTROL "	"	"
FUNCTIONAL COMPATIBILITY REQUIREMENTS	4/7/8/E-A/11-III,IV	"
COMMAND AND CONTROL SYSTEM REQUIREMENTS	E-A/11-IV	"
ELECTRICAL AND ELECTRONIC COMP REQUIREMENTS	"	"
CONFIGURATION REQUIREMENTS	4/C-A/11-III	"
QUALITATIVE MANPOWER REQUIREMENTS	4	"

NAVMAT/SYSCOM MAINTENANCE POLICIES (Block 6)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
MAINTENANCE LEVEL POLICIES & LIMITATIONS	COMMAND INSTRUCTIONS	DESCRIPTIVE
OVERHAUL CYCLE CRITERIA	"	"
MAINTENANCE DOCUMENTATION REQUIREMENTS	"	"
PREVENTIVE MAINTENANCE POLICY	"	"
CORRECTIVE MAINTENANCE POLICY	"	"
AUTOMATION POLICY (TESTING)	"	"
CONTRACTOR MAINTENANCE POLICY	"	"
LEVEL OF REPAIR CRITERIA	NAVMAT	DESCRIPTIVE/ (NAVMAT 4000.20A)
LIFE CYCLE COST ANALYSIS CRITERIA	5b	DESCRIPTIVE
SYSTEM STANDARDIZATION REQUIREMENTS	Z	"
ENVIRONMENTAL IMPACT REQUIREMENT	NAVMAT	DESCRIPTIVE/ (NAVMAT 4000.20A)
SAFETY POLICY	"	DESCRIPTIVE/ (NAVMAT 5100.6)
DATA MANAGEMENT POLICY	"	DESCRIPTIVE/ (NAVMAT 4000.15A)
CONFIGURATION MANAGEMENT POLICY	"	DESCRIPTIVE/ (NAVMAT 4130.1)
MANNING & SKILL LEVEL POLICIES	"	DESCRIPTIVE/ NUMERIC
ROTATABLE POOL POLICY	"	DESCRIPTIVE

NAVMAT/SYSCOM MAINTENANCE POLICIES (Block 6)

(OUTPUT) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
MAINTENANCE LEVEL LIMITATIONS	8/11-IV	DESCRIPTIVE/ NUMERIC
OVERHAUL CYCLE LIMITATIONS	8/11-IV	DESCRIPTIVE
PREVENTIVE MAINTENANCE REQUIREMENTS	8/11-IV/11-VIII	"
CORRECTIVE MAINTENANCE REQUIREMENTS	8/11-IV	"
AUTOMATION (TESTING) REQUIREMENTS	SE/11-IV	"
CONTRACTOR MAINTENANCE CRITERIA	8/11-IV/SS/12	"
LEVEL OF REPAIR GUIDANCE	SS/8/9/11-IV	"/NUMERIC
COST REQUIREMENTS	LF	DESCRIPTIVE
STANDARDIZATION REQUIREMENTS	E-A/SS/Z-A	"
ENVIRONMENTAL IMPACT REQUIREMENTS	E-A/FA/TD	"
SAFETY PROGRAM GUIDANCE	S-A	"
CONFIGURATION MANAGEMENT REQUIREMENTS	E-A/TD/C-A	"
DATA MANAGEMENT POLICY	TD	"
ROTATABLE POOL CRITERIA	SS/E-A	"
MANPOWER REQUIREMENTS	7/PT/11-IV	"
COST CONSTRAINTS	14	"

SYSTEM LOGISTIC CONCEPT (Block 7)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
MISSION TIME	1	TIME UNITS
AVAILABILITY REQUIREMENTS	1/4	NUMERIC
SYSTEM UTILIZATION	1/4	NUMERIC
UNDERWAY TIME	2	NUMERIC
TAV PREDICTIONS	2	TIME PERIODS
TIME BETWEEN OVERHAUL	2	TIME UNITS
OPERATIONAL REQUIREMENTS	2/4	DESCRIPTIVE
SERVICE LIFE CONCEPT	2/4	"
PHYSICAL CONSTRAINTS	3	AS LISTED ON BLOCK 3
ENVIRONMENTAL CONSTRAINTS	3	" " "
HUMAN FACTORS CONSTRAINTS	3	DESCRIPTIVE
DESIGN CONSTRAINTS	3	DESCRIPTIVE
SYSTEM COMPATIBILITY CONSTRAINTS	5b	DESCRIPTIVE
NAVY LOGISTIC CONSTRAINTS	5	AS LISTED ON BLOCK 5
SYSTEM/EQUIPMENT DEPLOYMENT	4	TIME UNITS
SUPPORT AND TEST EQUIPMENT CONCEPT	SE	DESCRIPTIVE/ NUMERIC
SUPPLY SUPPORT CONCEPT	SS	" "
TRANSPORTATION AND HANDLING CONCEPT	TH	" "
TECHNICAL DATA CONCEPT	TD	" "
FACILITIES CONCEPT	FA	" "
PERSONNEL AND TRAINING CONCEPT	PT	" "
SELF SUFFICIENCY CONSTRAINTS	5	" "
MANPOWER REQUIREMENTS	6	" "
SYSTEM LIFE CYCLE PARAMETERS	4	" "

SYSTEM LOGISTIC CONCEPT ANALYSIS (Block 7)

(OUTPUT) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
SUPPORT AND TEST EQUIPMENT REQUIREMENTS & CONSTRAINTS	SE/11-VI	DESCRIPTIVE
SUPPLY SUPPORT CONSTRAINTS	SS/8a/11-IX	"
TRANSPORTATION AND HANDLING CONSTRAINTS	TH/11-VI	"
TECHNICAL DATA CONSTRAINTS	TD/11-VIII	"
FACILITIES CONSTRAINTS	FA/11-VII	"
PERSONNEL & TRAINING CONSTRAINTS	PT/11-V	"
MAINTENANCE CONCEPT/CONSTRAINTS	8/11-III	"
PREVENTIVE MAINTENANCE	8/11-III,IV	"
CORRECTIVE MAINTENANCE	8/11-III,IV	"
OVERHAUL/TAV	" "	"
LIFE CYCLE CONCEPT	" "	"

SYSTEM MAINTENANCE CONCEPT (Block 8)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
FUNCTIONAL COMPATIBILITY REQUIREMENTS	5b	DESCRIPTIVE
MAINTENANCE LEVEL LIMITATIONS	6	DESCRIPTIVE
OVERHAUL CYCLE LIMITATIONS	6/7	DESCRIPTIVE/NUMERIC
PREVENTIVE MAINTENANCE GUIDANCE	6/7	DESCRIPTIVE
CORRECTIVE MAINTENANCE GUIDANCE	6/7	"
CONTRACTOR MAINTENANCE PLAN	6	"
MISSION TIME	1/4	TIME UNITS
MODIFICATION TIME	1	"
MAINTENANCE TIME	1	"
MAINTAINABILITY REQUIREMENTS	1	DESCRIPTIVE
UNDERWAY TIME	2	TIME UNITS
INPUT TIME	2	"
TAV CONCEPT/CONSTRAINTS	2/5/7	DESCRIPTIVE
SYSTEM OVERHAUL CONCEPT	2	"
TIME BETWEEN OVERHAUL	2	TIME UNITS
OPERATIONAL REQUIREMENTS	2	DESCRIPTIVE
OPERATIONAL PROFILE	2	TIME UNITS
OPERATING ENVIRONMENT	4	DESCRIPTIVE
SYSTEM LIFE CYCLE DURATION	4	DESCRIPTIVE/NUMERIC
" " " DEPLOYMENT	4/5	" "
" " " MODERNIZATION	4/5	" "
LEVEL OF REPAIR GUIDANCE	6	" "

SYSTEM MAINTENANCE CONCEPT (Block 8)

(OUTPUT) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
MAINTENANCE REQUIREMENTS CONCEPT	10/11-IV/16	DESCRIPTIVE/ NUMERIC
ORGANIZATIONAL LEVEL	11-IV/16	" "
INTERMEDIATE LEVEL	11-IV/16	" "
DEPOT LEVEL	11-IV/16	" "
REPAIR/REPLACE/DISCARD CRITERIA	SS/11-IV	" "
TAV/OVERHAUL CONCEPT	11-IV	DESCRIPTIVE
CONTRACTOR MAINTENANCE CONCEPT	SS/PT/11-VII	"
MAINTENANCE ACTIVITY PLAN	FA/SE/PT/11-VII	"
MAINTENANCE ACTIVITY LOCATION	FA/TH/SE/11-VII	GEOGRAPHIC LISTING
FAULT ISOLATION/SYSTEM TEST CONCEPT	PT/SE	DESCRIPTIVE
LEVEL OF AUTOMATION	SE/E-A	"
SUPPLY SUPPORT CONSTRAINTS	11-IV/SS	"
MANNING & SKILL LEVEL CONSTRAINTS	10/11-IV/PT/14	DESCRIPTIVE & NUMERIC
R/M/A REQUIREMENTS	9/R-A/M-A/E-A	NUMERIC
PREVENTIVE MAINTENANCE REQUIREMENTS	11-IV/R-A	DESCRIPTIVE/ NUMERIC
CORRECTIVE MAINTENANCE REQUIREMENTS	11-IV/R-A	" "

PLAN FOR SUPPORT (Block 9)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
SUPPORTING FACILITIES		
ORGANIZATIONAL MAINTENANCE	8	LISTING
INTERMEDIATE MAINTENANCE	8	LISTING/LOCATION
DEPOT MAINTENANCE	8	" "
OPERATIONAL	FA	LISTING
TESTING	SE/FA	LISTING/LOCATION
TRAINING	PT/FA	" "
FACILITY REQUIREMENTS	FA	EACH FACILITY
PERSONNEL	PT/FA	QUANTITATIVE
TRAINING	PT	DESCRIPTIVE
HANDLING EQUIPMENT	TH	LISTING
TEST EQUIPMENT	SE	"
TECHNICAL DATA	TD	DESCRIPTIVE
REPAIR PARTS	SS	LISTING
TOOLS	TH	"
TRANSPORTATION CONSIDERATIONS	TH	DESCRIPTIVE
TEST EQUIPMENT REQUIREMENTS	SE	"
GENERAL PURPOSE TEST EQUIPMENT	SE	" /LISTING
SPECIAL PURPOSE TEST EQUIPMENT	SE	" /LISTING
PROVISIONING PLAN	SS	DESCRIPTIVE
PERSONNEL PLAN	PT	"
OPERATOR	PT	"
OPERATOR/MAINTENANCE	PT	"
MAINTENANCE	PT	"
CIVILIAN (INTERMEDIATE/ DEPOT)	PT	"
TRAINING	PT	OPERATOR/MAINTENANCE
TECHNICAL DATA PLAN	TD	DESCRIPTIVE
REQUIREMENTS	TD	" /NUMERIC

PLAN FOR SUPPORT (Block 9)

(INPUT CONT.) DATA/INFORMATION	(SOURCE)	FORM/UNITS
SYSTEM EFFECTIVENESS REQUIREMENTS	8	DESCRIPTIVE/NUMERIC
RELIABILITY	8	" "
MAINTAINABILITY	8	" "
AVAILABILITY	8	" "
DEPENDABILITY	8	" "

PRELIMINARY R/M/A ANALYSIS (Block 10)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
MISSION RELIABILITY REQUIREMENTS	8	NUMERIC (MTBF/MTBMA)
REQUIRED MISSION FUNCTIONS	1	DESCRIPTIVE
CRITICAL TIME PERIODS	1	"
EXTERNAL ENVIRONMENTAL STRESS	3	"
INTERNAL ENVIRONMENTAL STRESS	3	"
OPERATIONAL CONCEPT/PROFILE	2	"
MAINTENANCE CONCEPT	8	"
MINIMUM ACCEPTABLE RELIABILITY REQUIREMENTS	SOR	NUMERIC (MTBF/MTBMA)
HUMAN FACTORS REQUIREMENTS	H-A	DESCRIPTIVE
SAFETY REQUIREMENTS	S-A/3	"
MAINTAINABILITY REQUIREMENTS	1	NUMERIC (MTTR/MAMDT)
MANNING & SKILL LEVEL CONSTRAINTS	8	DESCRIPTIVE/NUMERIC
FACILITY AVAILABILITY	FA	DESCRIPTIVE
TRAINING PROGRAM AVAILABILITY	PT	"
SIMILAR EQUIPMENT DATA	MDCS	HISTORICAL DATA
AVAILABILITY REQUIREMENTS	1	NUMERIC
SYSTEM/SUBSYSTEM CRITICALITY	1	RANKING
SYSTEM UTILIZATION RATE	1	NUMERIC
R/M/A GOALS	1	"
READINESS REQUIREMENTS - IN PORT	5	DESCRIPTIVE/NUMERIC
MANNING LEVELS - IN PORT	5	" "
READINESS CONDITIONS UNDERWAY	5	" "
OVERHAUL CYCLE CONSTRAINTS	5	DESCRIPTIVE
TENDER AVAILABILITY CONSTRAINTS	5	"
MODERNIZATION PROGRAM CONSTRAINTS	5	"
DEPLOYMENT CONSTRAINTS	5	"

PRELIMINARY R/M/A ANALYSIS (Block 10)

(OUTPUT) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
PROPOSED DESIGN RELIABILITY	11-II	NUMERIC (MTBF/MTBMA)
RELIABILITY ALLOCATION	11-II	NUMERIC
RELIABILITY PREDICTION	11-II	"
RELIABILITY DESIGN CRITERIA	11-II	DESCRIPTIVE
PRELIMINARY FMEA DATA	11-II/R-A	"
SIMILAR EQUIPMENT FAILURE DATA	11-II/R-A	HISTORICAL R/M DATA
RELIABILITY PROGRAM PLAN	R-A/11-IV	DESCRIPTIVE
MAINTAINABILITY PROGRAM PLAN	11-III	"
MAINTAINABILITY DESIGN CRITERIA	11-III/M-A	"
MAINTAINABILITY SUB-LEVEL ALLOCATION	11-III/M-A	NUMERIC (MTTR/MAMDT)
MAINTAINABILITY PREDICTION	M-A/11-II	NUMERIC
AVAILABILITY PREDICTION	R-A	"
AVAILABILITY ALLOCATION	R-A	"
PRELIMINARY R/M/A DATA	14	NUMERIC

MAINTENANCE ENGINEERING ANALYSIS - WORKSHEET I (Block 11)
SUMMARY

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
SECTION A:		
NOUN NOMENCLATURE-STANDARD	11-II-IX	DESCRIPTIVE
* NOUN NOMENCLATURE-NON-STANDARD	"	"
* PART NUMBER	"	NUMERIC
FEDERAL STOCK NUMBER	"	ALPHANUMERIC
NAVORD DRAWING NUMBER	"	NUMERIC
* NEXT HIGHER ASSEMBLY (NHA) NAME	"	DESCRIPTIVE
* NHA PART NUMBER	"	NUMERIC
* WORK BREAKDOWN STRUCTURE (WBS)	"	DESCRIPTIVE/ GRAPHIC
DRAWING NUMBER	"	NUMERIC
* EQUIPMENT IDENTIFICATION CODE (EIC)	"	ALPHANUMERIC
* ALLOWANCE PARTS LIST/COMPONENT IDENTIFICATION CODE (APL/CID)	"	"
STANDARD/NON-STANDARD CLASSIFICATION	"	CHECK
QUANTITY PER NHA	11-VI	NUMERIC
* ITEM CROSS REFERENCE:		
WBS	11-II-IX	NUMERIC
EIC	11-II-IX	ALPHANUMERIC
MEAR DOC. CONTROL NUMBER	11-IV-IX	NUMERIC
* MAINTENANCE INDEX PAGE NUMBER	TD	"
* TECHNICAL MANUAL NUMBER	TD	"
* MAINTENANCE TRAINING LEVEL	11-IV	O/I/D LEVEL
EQUIPMENT MODEL DESIGNATION	11-VI	NUMERIC
APPROXIMATE DIMENSIONS	3	"
APPROXIMATE WEIGHT	3	"
SHELF LIFE	SS	MONTHS
* ESTIMATED OVERHAUL COST	11-III	NUMERIC
ESTIMATED UNIT PRICE	SS/E-A	"

* Not normally available for preliminary MEA.

MAINTENANCE ENGINEERING ANALYSIS - WORKSHEET I (Block 11)
SUMMARY

(INPUT CONT.)

DATA/INFORMATION	(SOURCE)	FORM/UNITS
* SOURCE, MAINTENANCE AND RECOVERABILITY CODE	SS	NUMERIC
DESIGN SPECIFICATION NUMBER	E-A	"
* PROCUREMENT SPECIFICATION NUMBER	SS	"
* ENGINEERING DESIGN CHANGE NUMBER	E-A	"
CHANGE JUSTIFICATION	E-A	DESCRIPTIVE
R/M EFFECT OF CHANGE	R-A/M-A/E-A	"
MAINTENANCE SUPPORT EFFECT	E-A	"
MAINTENANCE IDENTIFICATION CODE	11-I,V-VIII	NUMERIC
MAINTENANCE MANHOURS PER YEAR	11-V	"
NUMBER OF MEN PER MAINTENANCE REQUIREMENT	11-IV,V	"
* SUPPORT EQUIPMENT REQUIRED	11-VI	YES/NO
FACILITIES REQUIREMENTS	11-VII	SHIP/TENDER/ ASHORE
* TECHNICAL DATA REQUIREMENTS	11-VIII	MRC/TM/ED/CT
* MATERIAL REQUIRED	11-IX	YES/NO
SAFETY CONSIDERATIONS REQUIRED	S-A	YES/NO
SECTION B:		
NEXT SUBORDINATE LEVEL MEAR DCN	11-I	NUMERIC
NEXT SUBORDINATE LEVEL MEAR NOMENCLATURE	11-I	DESCRIPTIVE
MAINTENANCE MANHOURS PER YEAR	11-I (Sub-ordinate MEAR)	NUMERIC
* SUPPORT EQUIPMENT	"	YES/NO
* FACILITY REQUIREMENTS	"	SHIP/TENDER/ ASHORE
* TECHNICAL DATA	"	MRC/TM/ED/CT
* MATERIAL REQUIRED	"	YES/NO
SAFETY	"	YES/NO

MEA WORKSHEET II - RELIABILITY DATA (Block 11)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
NOUN NOMENCLATURE-STANDARD	DSA	DESCRIPTIVE
* NOUN NOMENCLATURE-NON-STANDARD	CONTRACTOR	DESCRIPTIVE
* PART NUMBER	CONTRACTOR	NUMERIC
FEDERAL STOCK NUMBER	DSA	ALPHANUMERIC
NAVORD DRAWING NUMBER	PMO	NUMERIC
* NEXT HIGHER ASSEMBLY (NHA) NAME	WBS	DESCRIPTIVE
* NHA PART NUMBER	WBS	NUMERIC
* WORK BREAKDOWN STRUCTURE (WBS)	CONTRACTOR	DESCRIPTIVE/ GRAPHIC
DRAWING NUMBER	MFG. DWG.	NUMERIC
* EQUIPMENT IDENTIFICATION CODE (EIC)	CONTRACTOR	ALPHANUMERIC
* ALLOWANCE PARTS LIST/COMPONENT IDENTIFICATION CODE (APL/CID) NO.	SS	ALPHANUMERIC
PROPOSED SERVICE LIFE	2	YEARS
TIME BETWEEN OVERHAUL CONCEPT	2	MONTHS
REQUIRED MTBF	1	HOURS AND TENTHS
* PREDICTED MTBF	10/15	" " "
PRELIMINARY FAILURE DATA	R-A/10	DESCRIPTIVE
FAIL SAFE CHARACTERISTICS	S-A	"
SIMILAR SYSTEM DESCRIPTION	CONTRACTOR	"
SIMILAR SYSTEM FAILURE HISTORY	MDCS	"
* VERFIED MTBF	16	NUMERIC
PROPOSED DESIGN RELIABILITY	11-II	DESCRIPTIVE
SUB-LEVEL R ALLOCATION	11-II	DESCRIPTIVE/ NUMERIC

* Not normally available for preliminary MEA.

MEA WORKSHEET II - RELIABILITY DATA (Block 11)

DATA/INFORMATION (OUTPUT)	(DESTINATION)	FORM/UNITS
NOUN NOMENCLATURE-STANDARD	11-I	DESCRIPTIVE
* NOUN NOMENCLATURE-NON-STANDARD	"	"
* PART NUMBER	"	NUMERIC
FEDERAL STOCK NUMBER	"	ALPHANUMERIC
NAVORD DRAWING NUMBER	"	NUMERIC
* NEXT HIGHER ASSEMBLY (NHA) NAME	"	DESCRIPTIVE
* NHA PART NUMBER	"	NUMERIC
* WORK BREAKDOWN STRUCTURE (WBS) NO.	"	"
DRAWING NUMBER	"	"
* EQUIPMENT IDENTIFICATION CODE (EIC)	"	ALPHANUMERIC
* ALLOWANCE PARTS LIST/ COMPONENT IDENTIFICATION CODE (APL/CID)	"	"
DESIGN SERVICE LIFE	E-B/11-IV	YEARS
TIME BETWEEN OVERHAULS	M-B	MONTHS
REQUIRED MTBF	R-B	HOURS
* PREDICTED MTBF	R-B	"
* VERIFIED MTBF	R-C	"
PRIMARY FAILURE MODES	R-B/11-IV/E-A	DESCRIPTIVE
* SECONDARY FAILURE MODES	R-B/11-IV/E-A	"
FAILURE SYMPTOMS	R-B/11-IV/E-A	"
PROBABLE FAILURE EFFECTS	S-B/11-IV/E-A	"
* FAIL-SAFE CHARACTERISTICS	S-B	"
* REDUNDANT SYSTEM NOMENCLATURE	R-B/SS	"
* REDUNDANT SYSTEM NUMBER	R-B/SS	NUMERIC
FAILURE HISTORY	R-B	DESCRIPTIVE
SIMILAR PART NAME	R-B	"

* Not available for preliminary MEA.

MEA WORKSHEET II - RELIABILITY DATA (Block 11)

(OUTPUT CONT.)

DATA/INFORMATION	(DESTINATION)	FORM/UNITS
SIMILAR PART DRAWING NUMBER	R-B	NUMERIC
SIMILAR PART INSTALLATION DATA	R-B	DESCRIPTIVE
SIMILAR PART DESIGN LIFE	R-B	YEARS
SIMILAR PART ACTUAL MTBF	R-B	HOURS
DIFFERENCE IN PART APPLICATION	R-B/SS/11-VI	DESCRIPTIVE

MEA WORKSHEET III - MAINTAINABILITY & MAINTENANCE CONCEPT (Block 11)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
NOUN NOMENCLATURE-STANDARD	DSA	DESCRIPTIVE
NOUN NOMENCLATURE-NON-STANDARD	CONTRACTOR	"
PART NUMBER	CONTRACTOR	NUMERIC
FEDERAL STOCK NUMBER	DSA	ALPHANUMERIC
NAVORD DRAWING NUMBER	PMO	NUMERIC
NEXT HIGHER ASSEMBLY (NHA) NAME	WBS	DESCRIPTIVE
NHA PART NUMBER	WBS	NUMERIC
WORK BREAKDOWN STRUCTURE (WBS)	CONTRACTOR	DESCRIPTIVE/ GRAPHIC
DRAWING NUMBER	MFG. DWG.	NUMERIC
EQUIPMENT IDENTIFICATION CODE (EIC)	CONTRACTOR	ALPHANUMERIC
ALLOWANCE PARTS LIST/COMPONENT IDENTIFICATION CODE (APL/CID)	SS	ALPHANUMERIC
MAINTAINABILITY REQUIREMENTS	1	DESCRIPTIVE
UNDERWAY TIME	2	TIME UNITS
INPORT TIME	2	" "
ACTIVE TIME	1	" "
INACTIVE TIME	1	" "
UPTIME	1	" "
MISSION TIME	1	" "
MAINTENANCE TIME	1	" "
MAINTAINABILITY DESIGN CRITERIA	10,M-A	DESCRIPTIVE
FAULT ISOLATION CONCEPT	8	"
SYSTEM TESTING CONCEPT	8	"
ACCESSIBILITY REQUIREMENTS	3	"
PLATFORM APPLICATIONS	3	SHIP/AC LIST
FUNCTIONAL COMPATIBILITY REQUIREMENTS	3	DESCRIPTIVE
CONFIGURATION REQUIREMENTS	3	"
SYSTEM UTILIZATION	1	NUMERIC
SYSTEM EFFECTIVENESS GOALS	1	NUMERIC
R/M/A GOALS	1	NUMERIC

MEA WORKSHEET III - MAINTAINABILITY & MAINTENANCE CONCEPT (Block 11)

(INPUT CONT.)

DATA/INFORMATION	(SOURCE)	FORM/UNITS
SYSTEM/COMPONENT LOCATION	E-A	GRAPHIC
FACILITY AVAILABILITIES/LOCATION	10,FA	DESCRIPTIVE
TRAINING PROGRAM RESOURCE AVAILABILITY	10,PT	"
SUPPORT EQUIPMENT CONCEPT	8,SS	"
PROPOSED SERVICE LIFE	2	NUMERIC
SYSTEM/SUBSYSTEM CRITICALITY	1	"
PREVENTIVE MAINTENANCE CONCEPTS/ CONSTRAINTS	7	DESCRIPTIVE
CORRECTIVE MAINTENANCE CONCEPTS/ CONSTRAINTS	7	"
OVERHAUL/TAV CONCEPT	7	"
LIFE CYCLE SUPPORT CONSTRAINTS	7	"

(OUTPUT)

DATA/INFORMATION	(DESTINATION)	FORM/UNITS
NOUN NOMENCLATURE-STANDARD	11-I	DESCRIPTIVE
NOUN NOMENCLATURE-NON-STANDARD	"	"
PART NUMBER	"	NUMERIC
FEDERAL STOCK NUMBER	"	ALPHANUMERIC
NAVORD DRAWING NUMBER	"	NUMERIC
NEXT HIGHER ASSEMBLY (NHA) NAME	"	DESCRIPTIVE
NHA PART NUMBER	"	NUMERIC
WORK BREAKDOWN STRUCTURE (WBS)	"	DESCRIPTIVE/ GRAPHIC
DRAWING NUMBER	"	NUMERIC
EQUIPMENT IDENTIFICATION CODE (EIC)	"	ALPHANUMERIC
ALLOWANCE PARTS LIST/COMPONENT IDENTIFICATION CODE (APL/CID)	"	"
ITEM FUNCTION	"	DESCRIPTIVE

MEA WORKSHEET III - MAINTAINABILITY & MAINTENANCE CONCEPT (Block 11)

(OUTPUT CONT.) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
MAINTAINABILITY CHARACTERISTICS		
ACCESSIBILITY	M-A/H-A	DESCRIPTIVE
REMOVAL TIME	M-A/H-A	TIME UNITS
BUILT-IN TEST CONCEPT	M-A/SE	DESCRIPTIVE
FAULT ISOLATION CONCEPT	M-A/SE	"
MAINTENANCE PLAN		
DEPTH OF PLAN	M-A/12	DESCRIPTIVE
FREQUENCY-MAINTENANCE	M-A/12/11-IV	"
REQUIREMENTS	11-IV/12	"
TASKS	11-IV/12	"
REQUIREMENT JUSTIFICATION		
MTTR	R-A	NUMERIC
SPECIAL SUPPORT EQUIPMENT	11-IV	DESCRIPTIVE
NEW FACILITY REQUIREMENTS	11-IV,VII	"
SPECIAL TRAINING REQUIREMENTS	PT	"
COST	11-I	NUMERIC
ECONOMIC EVALUATION	11-I/LF	"
MAINTAINABILITY DESIGN		
DESIGN CONSIDERATIONS	M-A	DESCRIPTIVE
MTTR GOAL	M-A	NUMERIC
MTTR ACHIEVED	M-B	"
MOST CRITICAL REQUIREMENT	R-A/M-A/11-IV	DESCRIPTIVE

MEA WORKSHEET IV - MAINTENANCE TASK ANALYSIS (Block 11)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
NOUN NOMENCLATURE-STANDARD	DSA	DESCRIPTIVE
NOUN NOMENCLATURE-NON-STANDARD	CONTRACTOR	"
PART NUMBER	CONTRACTOR	NUMERIC
FEDERAL STOCK NUMBER	DSA	ALPHANUMERIC
NAVORD DRAWING NUMBER	PMO	NUMERIC
NEXT HIGHER ASSEMBLY (NHA) NAME	WBS	DESCRIPTIVE
NHA PART NUMBER	WBS	NUMERIC
WORK BREAKDOWN STRUCTURE (WBS)	CONTRACTOR	DESCRIPTIVE/ GRAPHIC
DRAWING NUMBER	MFG. DWG.	NUMERIC
EQUIPMENT IDENTIFICATION CODE (EIC)	CONTRACTOR	ALPHANUMERIC
ALLOWANCE PARTS LIST/COMPONENT IDENTIFICATION CODE (APL/CID)	SS	ALPHANUMERIC
PROPOSED SERVICE LIFE	2,11-II	NUMERIC
PRIMARY FAILURE MODES	11-II	DESCRIPTIVE
SECONDARY FAILURE MODES	11-II	"
FAILURE SYMPTOMS	11-II	"
PROBABLE FAILURE EFFECTS	11-II	"
DEPTH OF MAINTENANCE PLAN	11-III	"
MAINTENANCE FREQUENCY PLAN	11-III	"
MAINTENANCE REQUIREMENT PLAN	8/11-III,VIII	"
MAINTENANCE TASK PLAN	11-III,VIII	"
SPECIAL SUPPORT EQUIPMENT NEEDED	11-III/SS/SE	ALPHABETIC LIST
SPECIAL TRAINING REQUIREMENTS	11-III/PT	DESCRIPTIVE
NEW FACILITY REQUIREMENTS/ LOCATION	11-III/FA	"
SYSTEM TESTING CONCEPT/GUIDANCE	8/SE/6	"
SUPPLY SUPPORT CONCEPT/ CONSTRAINTS	8/8a	"
SAFETY DESIGN FEATURES	S-A/3	"
HUMAN COMPATIBILITY REQUIREMENTS	3	"

MEA WORKSHEET IV - MAINTENANCE TASK ANALYSIS (Block 11)

(INPUT CONT.) DATA/INFORMATION	(SOURCE)	FORM/UNITS
FUNCTIONAL COMPATIBILITY REQUIREMENTS	3/5b	DESCRIPTIVE
MANPOWER REQUIREMENTS	PT/5b	QUALITATIVE/ QUANTITATIVE
PERSONNEL CONSTRAINTS	8/10	DESCRIPTIVE
OPERATING ENVIRONMENT PARAMETERS	3	"
MOST CRITICAL REQUIREMENT	11-III	"
MISSION TIME FACTORS	1	TIME UNITS
SYSTEM EFFECTIVENESS PARAMETERS (R/M/A)	1	NUMERIC
UNDERWAY TIME	2	TIME UNITS
INPORT TIME	2	TIME UNITS
MAINTENANCE REQUIREMENT CONCEPT	8	DESCRIPTIVE/ NUMERIC
PREVENTIVE MAINTENANCE CONCEPT/CONSTRAINTS	7	"/"
CORRECTIVE MAINTENANCE CONCEPT/CONSTRAINTS	7	"/"
OVERHAUL/TAV CONCEPTS/ CONSTRAINTS	7/8	"/"
REPAIR/REPLACE/DISCARD CRITERIA	8	DISCRIPTIVE/ NUMERIC
SELF-SUFFICIENCY CONSTRAINTS	5	DESCRIPTIVE
NAVY 3M SYSTEM REQUIREMENTS	5	DESCRIPTIVE (OPNAV 43P2)
UNDERWAY PM LIMITATIONS	5/8	DESCRIPTIVE/ NUMERIC
UNDERWAY CM LIMITATIONS	5/8	" / "
WORKING SPACE ALLOCATIONS	5	DESCRIPTIVE
PERSONNEL SKILL LEVEL CONSTRAINTS	5/8	"
OVERHAUL CYCLE CONSTRAINTS	5	"
TAV CONSTRAINTS	5	"
MODERNIZATION PROGRAM CONSTRAINTS	5	"

MEA WORKSHEET IV - MAINTENANCE TASK ANALYSIS (Block 11)

(INPUT CONT.) DATA/INFORMATION	(SOURCE)	FORM/UNITS
DEPLOYMENT CONSTRAINTS	5	DESCRIPTIVE/ NUMERIC
COMMAND AND CONTROL SYSTEM COMPATIBILITY REQUIREMENTS	5b	"/"
ELECTRICAL AND ELECTRONIC COMPATIBILITY REQUIREMENTS	5b	"/"
CONFIGURATION REQUIREMENTS	5b	"/"
MAINTENANCE LEVEL LIMITATIONS	6/8	"/"
OVERHAUL CYCLE CRITERIA	6	"/"
CONTRACTOR MAINTENANCE CRITERIA	6	"/"

(OUTPUT) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
NOUN NOMENCLATURE-STANDARD	11-I	DESCRIPTIVE
NOUN NOMENCLATURE-NON-STANDARD	"	"
PART NUMBER	"	NUMERIC
FEDERAL STOCK NUMBER	"	ALPHANUMERIC
NAVORD DRAWING NUMBER	"	NUMERIC
NEXT HIGHER ASSEMBLY (NHA) NAME	"	DESCRIPTIVE
NHA PART NUMBER	"	NUMERIC
WORK BREAKDOWN STRUCTURE (WBS) NO.	"	"
DRAWING NUMBER	"	"
EQUIPMENT IDENTIFICATION CODE (EIC)	"	ALPHANUMERIC
ALLOWANCE PARTS LIST/ COMPONENT IDENTIFICATION CODE (APL/CID)	"	"
MAINTENANCE IDENTIFICATION CODE	11-I,V-VIII	ALPHANUMERIC⊕

⊕ See OR-30 for code identification.

MEA WORKSHEET IV - MAINTENANCE TASK ANALYSIS (Block 11)

(OUTPUT CONT.) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
MAINTENANCE REQUIREMENT	11-V	DESCRIPTIVE
FACILITY REQUIREMENT	11-I,VII/FA	DESCRIPTIVE
TRAINING REQUIREMENT CODE	11-I/PT	X,A,B,C⊕
TASK DATA CODE	11-I	A-F⊕
MAINTENANCE REQUIREMENT FREQ/ YEAR	11-V,VII	NUMERIC
STEP NUMBER	11-VII	"
SEQUENTIAL MAINTENANCE TASK	11-VII,VIII	DESCRIPTIVE
TECHNICAL DETAILS	TD/E-A/11-VIII	"
TOLERANCE REQUIREMENTS	TD/E-A	NUMERIC
TOOLS REQUIRED	TD/SS/16	ALPHABETIC LIST
TEST EQUIPMENT REQUIRED	TD/SE/16	" "
SUPPORT EQUIPMENT REQUIRED	TD/11-VI/SS/16	" "
SAFETY PRECAUTIONS	S-A/11-I/16	DESCRIPTIVE
REPAIR PART LINE ITEM CODE	SS/11-VI	ALPHABETIC LIST & QTY
CONSUMABLE MATERIALS	SS/11-I/16	" "
LOGISTIC SUPPORT PERSONNEL RESOURCE REQUIREMENTS	PT/11-I,V/16	DESCRIPTIVE
TASK TIME	PT/11-I,V	HOURS AND TENTHS
NUMBER OF MEN	"	QTY EACH SKILL LEVEL
RATING	"	CODE (NAVPERS 18068)
SKILL LEVEL	"	B,I,S⊕
NEC	"	CODE (NAVPERS 15105)

⊕ See OR-30 for code identification.

MEA WORKSHEET V - LOGISTIC SUPPORT PERSONNEL SUMMARY (Block 11)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
NOUN NOMENCLATURE-STANDARD	DSA	DESCRIPTIVE
NOUN NOMENCLATURE-NON-STANDARD	CONTRACTOR	"
PART NUMBER	"	NUMERIC
FEDERAL STOCK NUMBER	DSA	ALPHANUMERIC
NAVORD DRAWING NUMBER	PMO	NUMERIC
NEXT HIGHER ASSEMBLY (NHA) NAME	WBS	DESCRIPTIVE
NHA PART NUMBER	WBS	NUMERIC
WORK BREAKDOWN STRUCTURE (WBS)	CONTRACTOR	DESCRIPTIVE/ GRAPHIC
DRAWING NUMBER	MFG. DWG.	NUMERIC
EQUIPMENT IDENTIFICATION CODE (EIC)	CONTRACTOR	ALPHANUMERIC
ALLOWANCE PARTS LIST/COMPONENT IDENTIFICATION CODE (APL/CID) NO.	SS	ALPHANUMERIC
MAINTENANCE IDENTIFICATION CODE	11-IV	ALPHANUMERIC
MAINTENANCE TASKS	11-IV	DESCRIPTIVE
TECHNICAL QUALIFICATIONS	NAVPERS 18068	"(MANUAL)
NEC SYSTEM/CODES	NAVPERS 15105	" "
MAINTENANCE REQUIREMENTS	11-IV	DESCRIPTIVE
MAINTENANCE TASK TIME	"	TIME UNITS
NUMBER OF MEN REQUIRED	"	NUMERIC
PERSONNEL RATING REQUIRED	"	CODE LISTING & QTY
PERSONNEL SKILL LEVEL REQUIRED	"	B,I,S
MAINTENANCE REQUIREMENT FREQ/YEAR	"	NUMERIC
PERSONNEL RESOURCE REQUIREMENTS	"	DESCRIPTIVE
PERSONNEL & TRAINING REQUIREMENTS/ CONSTRAINTS	7	"

MEA WORKSHEET V - LOGISTIC SUPPORT PERSONNEL SUMMARY (Block 11)

(OUTPUT) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
NOUN NOMENCLATURE-STANDARD	11-I	DESCRIPTIVE
NOUN NOMENCLATURE-NON-STANDARD	"	"
PART NUMBER	"	NUMERIC
FEDERAL STOCK NUMBER	"	ALPHANUMERIC
NAVORD DRAWING NUMBER	"	NUMERIC
NEXT HIGHER ASSEMBLY (NHA) NAME	"	DESCRIPTIVE
NHA PART NUMBER	"	NUMERIC
WORK BREAKDOWN STRUCTURE (WBS) NO.	"	"
DRAWING NUMBER	"	"
EQUIPMENT IDENTIFICATION CODE (EIC)	"	ALPHANUMERIC
ALLOWANCE PARTS LIST/COMPONENT IDENTIFICATION CODE (APL/CID)	"	"
MAINTENANCE IDENTIFICATION CODE	11-I	ALPHANUMERIC CODE⊕
PERSONNEL RATING	PT	NAVPERS 18068
PERSONNEL SKILL LEVEL	PT	B,I,S⊕
NAVY ENLISTED CLASSIFICATION CODE (NEC)	PT	NUMERIC
MAINTENANCE TASK TIME	E-A/PT	HOURS AND TENTHS
NUMBER OF MEN PER SKILL	11-I/PT	NUMERIC
TOTAL ANNUAL TASK TIME	11-I	HOURS
TOTAL MAINTENANCE MANHOURS (MMH) PER YEAR	11-I/LF/PT	HOURS
MMH/YEAR BY MAINTENANCE LEVEL	PT	HOURS

⊕ See OR-30 for code identification.

MEA WORKSHEET VI - SUPPORT EQUIPMENT REQUIREMENTS SHEET (Block 11)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
MAINTENANCE IDENTIFICATION CODE	11-IV	ALPHANUMERIC
AUXILIARY SYSTEM REQUIREMENTS	3	DESCRIPTIVE
SUPPORT EQUIPMENT REQUIREMENTS	11-IV/7	"
END ARTICLE PART NUMBER	11-IV	NUMERIC
END ARTICLE MODEL NUMBER	SS/E-A	"
END ARTICLE TYPE NUMBER	SS	"
END ARTICLE CONTRACT NUMBER	SS	"
END ARTICLE ITEM NUMBER	SS	"
END ARTICLE QUANTITIES NUMBER	2,4	"
SUPPORT AND TEST EQUIPMENT CONSTRAINTS	7	DESCRIPTIVE/ NUMERIC

MEA WORKSHEET VI - SUPPORT EQUIPMENT REQUIREMENTS SHEET (Block 11)

(OUTPUT) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
EQUIPMENT CATEGORY	SS	DESCRIPTIVE
END ARTICLE MODEL NO.	SS/11-I	NUMERIC
END ARTICLE TYPE NO.	SS/11-I	"
END ARTICLE CONTRACT NO.	" "	"
END ARTICLE ITEM NO.	" "	"
END ARTICLE QUANTITIES	" "	"
SUPPORT EQUIPMENT NOUN NOMENCLATURE	SS	ALPHANUMERIC
SUPPORT EQUIPMENT PART NUMBER	"	NUMERIC
FEDERAL STOCK NUMBER (FSN)	"	ALPHANUMERIC
DOCUMENT CONTROL NUMBER	"	NUMERIC
SUPPORT EQUIPMENT REQUIREMENT	SS/E-A	DESCRIPTIVE
SUPPORT EQUIPMENT CAPABILITIES	SS/E-A	"
SUPPORT EQUIPMENT FUNCTION	" "	"
SUPPORT EQUIPMENT OPERATION	" "	"
MAINTENANCE LEVEL FUNCTION (MLF)	" "	"
NUMBER OF ITEMS PER MLF	" "	NUMERIC
SUPPORT EQUIPMENT DESCRIPTION		
MATERIAL REQUIRED	SS/E-A	DESCRIPTIVE
FINISH REQUIRED	SS/E-A	"
ENVELOPE DIMENSIONS	" "	NUMERIC
WEIGHT	" "	"
SERVICE REQUIREMENTS	" "	DESCRIPTIVE
ESTIMATED COSTS (PER UNIT)		
NON-RECURRING	SS/LF	DOLLARS
RECURRING	SS/LF	"
ENGINEERING	SS/LF/E-A	"
FABRICATION AND TESTING	SS/LF	"

MEA WORKSHEET VII - MAINTENANCE AND SUPPORT FACILITY REQUIREMENTS (Block 11)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
NOUN NOMENCLATURE-STANDARD	DSA	DESCRIPTIVE
NOUN NOMENCLATURE-NON-STANDARD	CONTRACTOR	DESCRIPTIVE
PART NUMBER	CONTRACTOR	NUMERIC
FEDERAL STOCK NUMBER	DSA	ALPHANUMERIC
NAVORD DRAWING NUMBER	PMO	NUMERIC
NEXT HIGHER ASSEMBLY (NHA) NAME	WBS	DESCRIPTIVE
NHA PART NUMBER	WBS	NUMERIC
WORK BREAKDOWN STRUCTURE (WBS)	CONTRACTOR	DESCRIPTIVE/ GRAPHIC
DRAWING NUMBER	MFG. DWG.	NUMERIC
EQUIPMENT IDENTIFICATION CODE (EIC)	CONTRACTOR	ALPHANUMERIC
ALLOWANCE PARTS LIST/COMPONENT IDENTIFICATION CODE (APL/CID) NO.	SS	ALPHANUMERIC
MAINTENANCE IDENTIFICATION CODE	11-IV	ALPHANUMERIC
MAINTENANCE FACILITY REQUIREMENT	11-IV/7	DESCRIPTIVE
MAINTENANCE REQUIREMENT FREQ/YEAR	11-IV	NUMERIC
SEQUENTIAL MAINTENANCE TASKS	11-IV	DESCRIPTIVE
NEW FACILITY REQUIREMENTS	11-III	"
MAINTENANCE FACILITY AVAILABILITY	10/FA	TYPE & LOCATION
OPERATIONAL PROFILE	2	GRAPHIC/ NUMERIC
APPROXIMATE SIZE	3	NUMERIC
APPROXIMATE WEIGHT	3	"
APPROXIMATE VOLUME	3	"
POWER REQUIREMENTS	3	DESCRIPTIVE
AUXILIARY SYSTEM REQUIREMENTS	3	"
INPORT TIME	2	TIME UNITS
TENDER AVAILABILITY CONCEPT	2	DESCRIPTIVE
OPERATING AREA	2	LOCATION
FACILITY CONSTRAINTS	7	DESCRIPTIVE

MEA WORKSHEET VII - MAINTENANCE AND SUPPORT FACILITY REQUIREMENTS (Block 11)

(INPUT CONT.)

DATA/INFORMATION	(SOURCE)	FORM/UNITS
CONTRACTOR MAINTENANCE CONCEPT	8	DESCRIPTIVE
MAINTENANCE FACILITY PLAN	8	"
MAINTENANCE FACILITY LOCATION	8	GEOGRAPHICAL LIST

(OUTPUT)

DATA/INFORMATION	(DESTINATION)	FORM/UNITS
NOUN NOMENCLATURE-STANDARD	11-I	DESCRIPTIVE
NOUN NOMENCLATURE-NON-STANDARD	"	"
PART NUMBER	"	NUMERIC
FEDERAL STOCK NUMBER	"	ALPHANUMERIC
NAVORD DRAWING NUMBER	"	NUMERIC
NEXT HIGHER ASSEMBLY (NHA) NAME	"	DESCRIPTIVE
NHA PART NUMBER	"	NUMERIC
WORK BREAKDOWN STRUCTURE (WBS) NO.	"	"
DRAWING NUMBER	"	"
EQUIPMENT IDENTIFICATION CODE (EIC)	"	ALPHANUMERIC
ALLOWANCE PARTS LIST/COMPONENT IDENTIFICATION CODE (APL/CID)	"	"
MAINTENANCE IDENTIFICATION CODE	11-I	"
FACILITY FUNCTIONAL ANALYSIS	FA	DESCRIPTIVE
REQUIRED FUNCTION	FA	DESCRIPTIVE
CHARACTERISTICS	FA	"
ALTERNATE METHODS	FA/E-A	"
FACILITY LOCATION	11-I	"
FACILITY DESIGN CRITERIA	FA	"
SPACE	FA	SQUARE/CUBIC FEET
MECHANICAL	FA	DESCRIPTIVE
ELECTRICAL	FA	"
HYDRAULIC	FA	"
WORKING AREA	FA	SQUARE FEET

MEA WORKSHEET VII - MAINTENANCE AND SUPPORT FACILITY REQUIREMENTS (Block 11)

(OUTPUT CONT.) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
FACILITY DESIGN CRITERIA - CONT.	FA	
STORAGE AREA	FA	SQUARE FEET
ENVIRONMENTAL REQUIREMENTS	FA	DESCRIPTIVE
DESIGN CRITERIA JUSTIFICATION	FA	"

MEA WORKSHEET VIII - TECHNICAL DATA SUMMARY (Block 11)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
NOUN NOMENCLATURE-STANDARD	DSA	DESCRIPTIVE
NOUN NOMENCLATURE-NON-STANDARD	CONTRACTOR	DESCRIPTIVE
PART NUMBER	"	NUMERIC
FEDERAL STOCK NUMBER	DSA	ALPHANUMERIC
NAVORD DRAWING NUMBER	PMO	NUMERIC
NEXT HIGHER ASSEMBLY (NHA) NAME	WBS	DESCRIPTIVE
NHA PART NUMBER	"	NUMERIC
WORK BREAKDOWN STRUCTURE (WBS)	CONTRACTOR	DESCRIPTIVE/ GRAPHIC
DRAWING NUMBER	MFG. DWG.	NUMERIC
EQUIPMENT IDENTIFICATION CODE (EIC)	CONTRACTOR	ALPHANUMERIC
ALLOWANCE PARTS LIST/COMPONENT IDENTIFICATION CODE (APL/CID) NO.	SS	"
MAINTENANCE IDENTIFICATION CODE	11-IV	NUMERIC
MAINTENANCE TASKS	11-IV	DESCRIPTIVE
TECHNICAL DETAILS	"	"
MAINTENANCE REQUIREMENTS	"	"
ENGINEERING DRAWINGS	E-A	"/NUMERIC
CALIBRATION CRITERIA	TD/SE	"/"
PREVENTIVE MAINTENANCE GUIDANCE	6	DESCRIPTIVE
TECHNICAL DATA REQUIREMENTS/ CONSTRAINTS	7	"

MEA WORKSHEET VIII - TECHNICAL DATA SUMMARY (Block 11)

(OUTPUT) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
NOUN NOMENCLATURE-STANDARD	11-I	DESCRIPTIVE
NOUN NOMENCLATURE-NON-STANDARD	"	"
PART NUMBER	"	NUMERIC
FEDERAL STOCK NUMBER	"	ALPHANUMERIC
NAVORD DRAWING NUMBER	"	NUMERIC
NEXT HIGHER ASSEMBLY (NHA) NAME	"	DESCRIPTIVE
NHA PART NUMBER	"	NUMERIC
WORK BREAKDOWN STRUCTURE (WBS) NO.	"	"
DRAWING NUMBER	"	"
EQUIPMENT IDENTIFICATION CODE (EIC)	"	ALPHANUMERIC
ALLOWANCE PARTS LIST/COMPONENT IDENTIFICATION CODE (APL/CID)	"	"
MAINTENANCE IDENTIFICATION CODE	"	"
TECHNICAL MANUAL REQUIREMENTS	TD/11-I/16	OP/OD/CH/ ORDALT ⊕
MAINTENANCE REQUIREMENT CARD (MRC)	TD/11-I/16	X ⊕
ENGINEERING DRAWING NUMBER (TD)	TD/11-I	NUMERIC
CALIBRATION CRITERIA REQUIRED	TD/SE/11-I/16	X ⊕

⊕ See OR-30 page B-38 for description.

PLAN FOR MAINTENANCE (Block 12)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
MAINTENANCE CONCEPT	8	DESCRIPTIVE
MAINTENANCE LEVEL REQUIREMENTS	11-IV	O/I/D MAINT. REQMTS
MAINTENANCE ACTIVITY REQUIREMENTS	11-VIII	DESCRIPTIVE
MAINTENANCE ACTIVITY LOCATION	FA	GEOGRAPHIC
SYSTEM TESTING REQUIREMENTS	"	DESCRIPTIVE
SYSTEM OVERHAUL REQUIREMENTS	11-IV	"/NUMERIC
MAINTAINABILITY DEMONSTRATION PLANS	16	DESCRIPTIVE
R/M DESIGN DATA:		
MILITARY ESSENTIALITY CODE	S-A/11-IXa	NUMERIC
TOTAL SERVICE LIFE	R-B	YEARS
TIME BETWEEN OVERHAUL	2/M-B	MONTHS
RELIABILITY GOALS	4/R-B	(MTBF/MTBMA)
MAINTAINABILITY GOALS	4/R-B	(MTTR/MAMDT)
PROBABLE FAILURE MODES	R-A	DESCRIPTIVE
RESULTS OF FAILURE	R-A	"
HUMAN FACTORS REQUIREMENTS	H-A	DESCRIPTIVE
MAINTENANCE REQUIREMENTS:		
MAINTENANCE ACTIONS REQUIRED	11-IV	"
PARTS REQUIRED	"	LIST
TOOLS REQUIRED	"	LIST
TEST EQUIPMENT REQUIRED	"	LIST (SPTE/ GPTE)
DATA REQUIRED	"	DESCRIPTIVE
MAINTENANCE TASKS:	11-IV	"
PROCEDURAL SEQUENCE	"	"
FREQUENCY OF OCCURRENCE	"	REQUIRED CYCLE
PERSONNEL PLANNING DATA:		
PERSONNEL RATING (EACH TASK/ EACH LEVEL)	11-V	CODE (NAVPERS 18068)

(INPUT CONT.)

DATA/INFORMATION	(SOURCE)	FORM/UNITS
PERSONNEL PLANNING DATA - CONT.		
PERSONNEL SKILL LEVELS (EACH TASK/EACH LEVEL)	11-V	B,I,S
PERSONNEL REQUIREMENTS-QUALITATIVE	11-V	DESCRIPTIVE
PERSONNEL REQUIREMENTS-QUANTITATIVE	11-V	NUMERIC
PERSONNEL DEVELOPMENT PROGRAMS	PT	DESCRIPTIVE
PERSONNEL SCHEDULING (PM & CM)	11-IV	SCHEDULE (TIME APPLICATION)
MAINTENANCE INFORMATION:		
MAINTENANCE PUBLICATIONS	11-VIII	NUMERIC
MAINTENANCE ENGINEERING DRAWINGS	11-VIII	"
MAINTENANCE AIDS	"	DESCRIPTIVE
MRC CARDS	11-VIII	OPNAV 43P2 FORM
PMS SCHEDULES	"	" " "
SUPPORT AND TEST EQUIPMENT SUMMARY		
SPECIAL PURPOSE TEST EQUIPMENT (SPTE)	11-IV	ALPHANUMERIC LIST
GENERAL PURPOSE TEST EQUIPMENT (GPTE)	"	" "
REPAIR PARTS REQUIREMENT SUMMARY		
PARTS REQUIRING REPLACEMENT	11-IX	PARTS LISTING
MATERIAL REQUIRING REPLACEMENT	"	MATERIAL LISTING
REPLACEMENT CYCLE	"	NUMERIC
MAINTENANCE LEVELS	"	DESCRIPTIVE
MAINTENANCE FACILITIES REQUIREMENTS SUMMARY:		
MAINTENANCE REQUIREMENTS	11-IV	DESCRIPTIVE
FACILITY FUNCTION	11-VII	"
FACILITY SIZE	"	NUMERIC
FACILITY REQUIREMENTS	"	DESCRIPTIVE
CONTRACTOR MAINTENANCE CRITERIA	6	"

INTEGRATED LOGISTIC SUPPORT PLAN (Block 13)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
AVAILABILITY REQUIREMENTS	R-B/14	NUMERIC
RELIABILITY REQUIREMENTS	"	"
MAINTAINABILITY REQUIREMENTS	M-B/14	"
LIFE CYCLE SUPPORT CONCEPT	SS/9	DESCRIPTIVE
ORGANIZATIONAL FUNCTIONAL REQUIREMENTS	11-IV	" "
INTERMEDIATE FUNCTIONAL REQUIREMENTS	"	"
DEPOT FUNCTIONAL REQUIREMENTS	"	"
QUANTITY OF PERSONNEL	11-VIII/PT	NUMERIC
ORGANIZATIONAL MAINTENANCE	" "	"
INTERMEDIATE MAINTENANCE	" "	"
DEPOT LEVEL MAINTENANCE	" "	"
PERSONNEL SKILL LEVEL	PT/11-IV	DESCRIPTIVE
ORGANIZATIONAL MAINTENANCE	" "	"
INTERMEDIATE MAINTENANCE	" "	"
DEPOT MAINTENANCE	" "	"
MAN-HOUR REQUIREMENTS	11-IV	NUMERIC
CONDITION ASSIGNMENTS	R-B/14	DESCRIPTIVE/ NUMERIC
TRAINING REQUIREMENTS	PT	DESCRIPTIVE
MAINTENANCE FACILITY REQUIREMENTS	FA/12	"
ORGANIZATIONAL MAINTENANCE	"	"
INTERMEDIATE MAINTENANCE	"	"
DEPOT MAINTENANCE	"	"
MAINTENANCE DATA REQUIREMENTS	TD/12	"
LIFE CYCLE MAINTENANCE RESOURCE REQUIREMENTS	12/SS	"
MAINTENANCE ENGINEERING APPROACH	12/R-A	"
MEA DOCUMENTATION APPROACH	12/TD	"

DETAILED R/M/A ANALYSIS (Block 14)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
RELIABILITY REQUIREMENTS	13/R-B	NUMERIC
MAINTAINABILITY REQUIREMENTS	13/M-B	"
AVAILABILITY REQUIREMENTS	13/R-B	"
CONDITION (READINESS) ASSIGNMENTS	13	DESCRIPTIVE/ NUMERIC
REQUIRED MISSION FUNCTIONS	10	DESCRIPTIVE
CRITICAL TIME PERIODS	10	TIME UNITS
MINIMUM ACCEPTABLE RELIABILITY REQUIREMENTS	10	NUMERIC
HUMAN FACTORS REQUIREMENTS	H-B	DESCRIPTIVE
SAFETY REQUIREMENTS	S-B	"
SIMILAR EQUIPMENT FAILURE DATA	MDCS	"/NUMERIC
SYSTEM/SUBSYSTEM CRITICALITY	10	DESCRIPTIVE
SYSTEM UTILIZATION RATE	10	NUMERIC
SYSTEM EFFECTIVENESS REQUIREMENTS	10	"
PRELIMINARY R/M/A DATA	10	DESCRIPTIVE/ NUMERIC
OPERATIONAL CONCEPT	2	DESCRIPTIVE
SYSTEM SUPPORT CONCEPT	9/SS	"
MANPOWER CONSTRAINTS	8	NUMERIC
COST CONSTRAINTS	6	NUMERIC

DETAILED R/M/A ANALYSIS (Block 14)

(OUTPUT) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
RELIABILITY PREDICTION	15/16/R-C	NUMERIC
RELIABILITY ALLOCATION (LOWER LEVELS)	15/16/R-C	"
RELIABILITY DESIGN STANDARDS	15/E-A	DESCRIPTIVE/ NUMERIC
RELIABILITY DESIGN SPECIFICATIONS	15/E-A	DESCRIPTIVE
FMEA DATA:		
ITEM FAILURE MODES	15	"
ITEM FAILURE RATES	"	NUMERIC
ITEM FAILURE SYMPTOMS	"	DESCRIPTIVE
ITEM FAILURE CRITICALITY	"	"
PRIMARY FAILURE EFFECTS	"	"
SECONDARY FAILURE EFFECTS	"	"
RELIABILITY DATA REQUIREMENTS	TD/E-D	NUMERIC
MAINTAINABILITY PREDICTION	M-C/15	"
MAINTAINABILITY DESIGN CRITERIA	M-C/15	DESCRIPTIVE
MAINTAINABILITY DESIGN TRADEOFFS	M-C/15	"
MAINTAINABILITY ALLOCATIONS	M-C	NUMERIC
AVAILABILITY PREDICTION	R-C/M-C	"
AVAILABILITY ALLOCATION	" "	"

MAINTAINABILITY DEMONSTRATION AND TEST (Block 16)

(INPUT) DATA/INFORMATION	(SOURCE)	FORM/UNITS
MAINTAINABILITY PLAN:	CONTRACTOR	DESCRIPTIVE (MIL-STD-471)
MAINTENANCE CONCEPT	8	DESCRIPTIVE
MAINTENANCE ENVIRONMENT	3	"
LEVELS OF MAINTENANCE TO BE DEMONSTRATED	PMO/LEM	"/NUMERIC
TEST MODES OF OPERATION	" "	DESCRIPTIVE
CONFIGURATION STATUS	" "	"
QUANTITATIVE M REQUIREMENTS	4	NUMERIC
TEST DEMONSTRATION SITES	PMO/LEM	DESCRIPTIVE
FACILITY (M TEST) REQUIREMENTS	CONTRACTOR	"
PARTICIPATING AGENCIES	PMO/LEM	"
ITEMS TO BE TESTED	" "	"
TEST ORGANIZATION	PMO/LEM/15	"
MANAGERIAL PERSONNEL	PMO/LEM	"
TECHNICAL PERSONNEL	" "	"
MAINTENANCE PERSONNEL	" "	"
OPERATING PERSONNEL	" "	"
GOVERNMENT/CONTRACTOR PERSONNEL	" "	"
TRAINING REQUIREMENTS	" "	"
DEMONSTRATION SUPPORT MATERIAL	" "	"
SUPPORT EQUIPMENT REQUIRED	15	"/LIST
TOOLS REQUIRED	"	"/"
TEST EQUIPMENT REQUIRED	"	"/"
TECHNICAL PUBLICATIONS REQUIRED	"	"/"
SPARES & CONSUMABLES REQUIRED	"	"/"
SAFETY EQUIPMENT REQUIRED	"	"/"

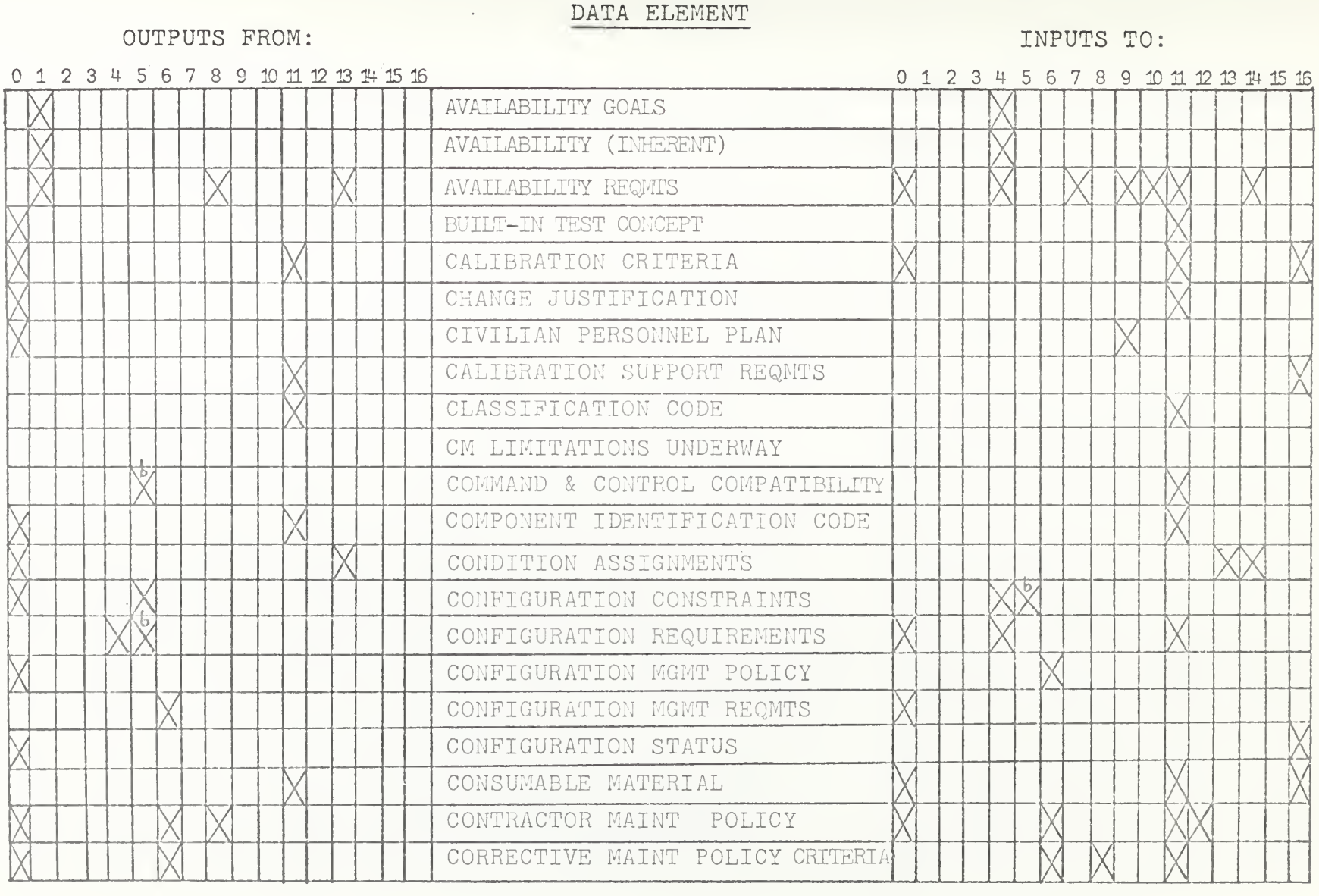
MAINTAINABILITY DEMONSTRATION AND TEST (Block 16)

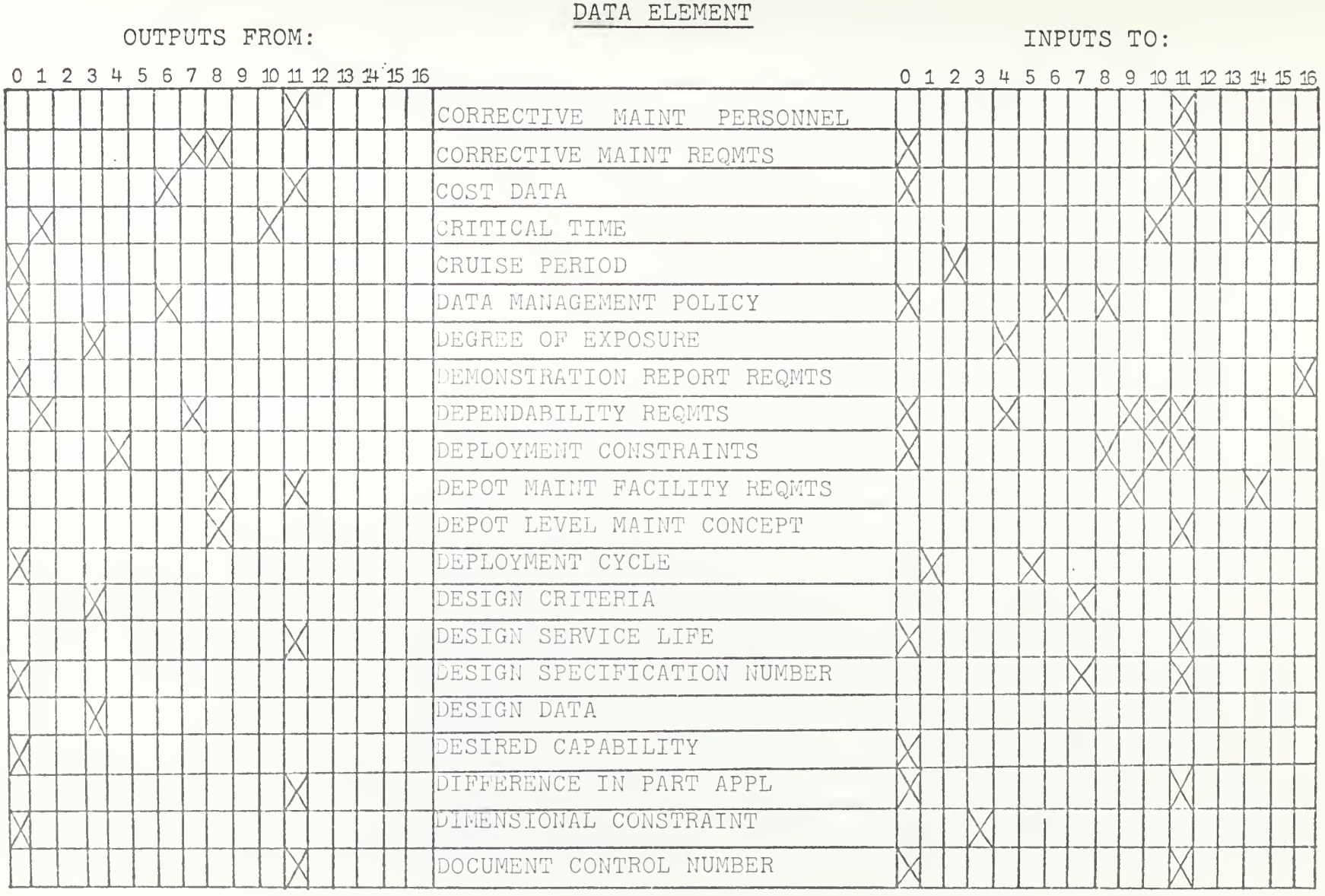
(INPUT CONT.)

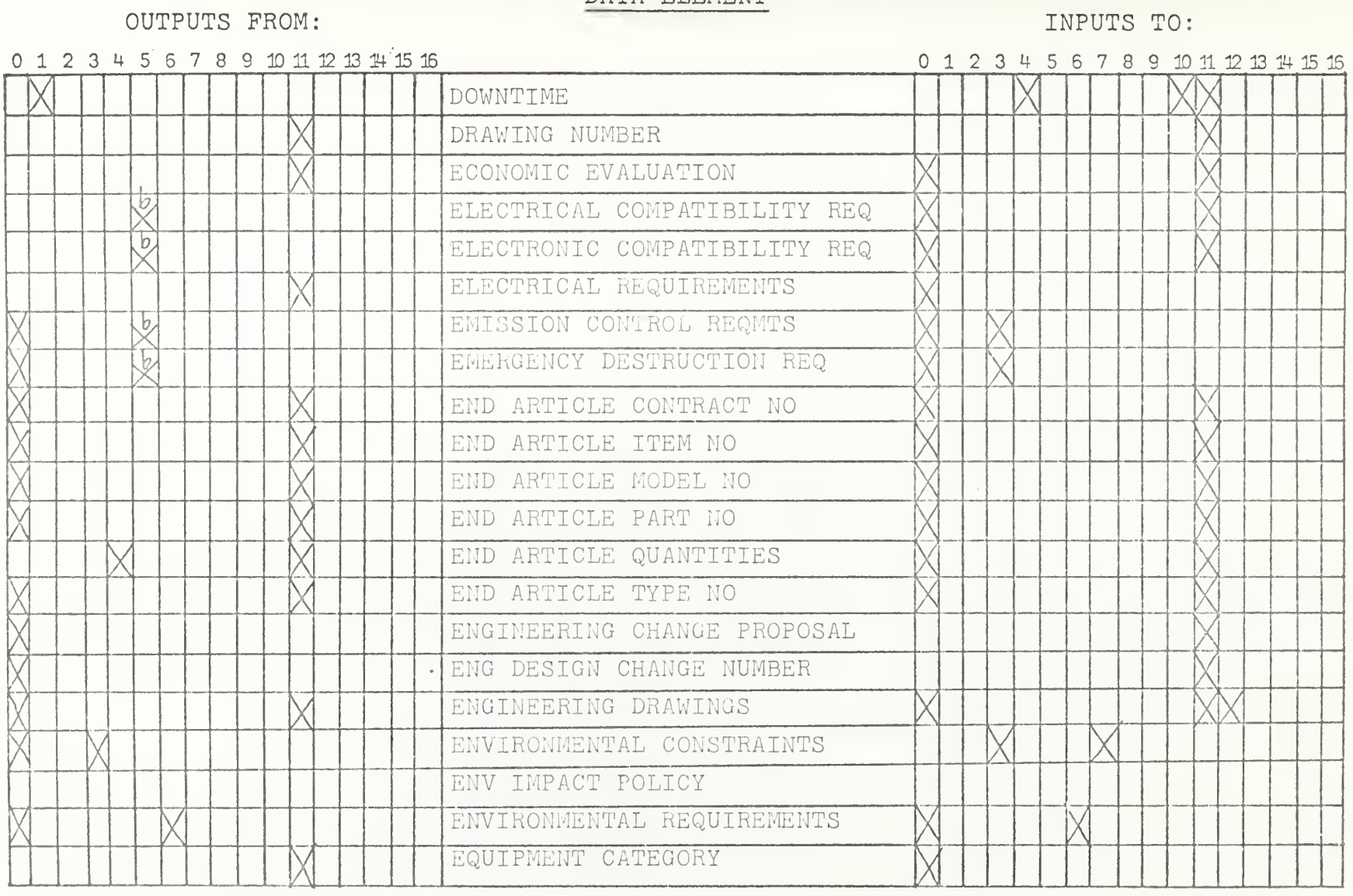
DATA/INFORMATION	(SOURCE)	FORM/UNITS
DEMONSTRATION SUPPORT MATERIAL - CONT.	PMO/LEM	DESCRIPTIVE
CALIBRATION SUPPORT REQUIREMENTS	CONTRACTOR/15	DESCRIPTIVE
TEST SCHEDULE	CONTRACTOR	SCHEDULE
TEST OBJECTIVES	"	DESCRIPTIVE
TEST SELECTION METHOD	"	"
TEST METHOD	"	"
TEST DATA ACQUISITION METHOD	"	"
FAULT/FAILURE SIMULATION METHODS	"	"
DEMONSTRATION REPORT REQUIREMENTS	PMO/LEM	"

(OUTPUT) DATA/INFORMATION	(DESTINATION)	FORM/UNITS
MAINTENANCE PREPARATION TIME	M-D/TEST RPT	TIME UNITS
MAINTENANCE FAULT ISOLATION TIME	"	" "
MAINTENANCE FAULT CORRECTION TIME	"	" "
MAINTENANCE ADJUSTMENT & CALIBRATION TIME	"	" "
MAINTENANCE FINAL TEST TIME	"	" "
MAINTENANCE TURNAROUND TIME	"	" "
SUPPLY DELAY TIME	"	" "
ADMINISTRATIVE DELAY TIME	"	" "
FACTORS WHICH INFLUENCED DATA	"	DESCRIPTIVE
QUALITATIVE ASSESSMENT	"	"
MEAN CORRECTIVE MAINTENANCE DOWNTIME	"	NUMERIC (MIL-STD-471)
MEAN PREVENTIVE MAINTENANCE DOWNTIME	"	" "
MEAN MAINTENANCE DOWNTIME	"	" "
MAXIMUM CORRECTIVE MAINTENANCE DOWNTIME	"	" "
MAXIMUM PREVENTIVE MAINTENANCE DOWNTIME	"	" "
MAXIMUM ASSOCIATED PERCENTILE	"	PERCENTILE
PREVENTIVE MAINTENANCE DEMONSTRATED	"	NUMERIC (% QUANTITY)
CORRECTIVE MAINTENANCE DEMONSTRATED	"	NUMERIC

OUTPUTS FROM: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	DATA ELEMENT	INPUTS TO: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
X . . X	ACCESS REQD	X . . X . . . . . . X . . . . .
X . . X	ACCEPTABLE HAZARD	X . . X . . . .
. X	ACTIVE TIME	. . . . X . . . . . X X . . . . .
. X	ALERT TIME	. . . . X . . . . . X X . . . . .
. . . . X	ALLOCATION OF GOALS	. . . . X . . . . .
. . X . X	ALLOWANCE QUANTITY	X . . . . X . . . . .
X . . . . X	ALLOWANCE PARTS LIST	. . . . X . . . . .
. . . . X	ALTERNATE METHOD	X . . . .
. . . . X	ANNUAL MAINT MANHOURS	. . . . X . . . . .
. X	ANNUAL NUMBER OF MISSIONS	. . . . X . . . .
. X	ANNUAL OPERATING DAYS	. . . . X . . . X X . X X . . . .
. . . . X	ANNUAL TASK TIME	. . . . X . . . . .
. . . X	APPROXIMATE DIMENSIONS	. . . . X . . . . .
. . . X	APPROXIMATE WEIGHT	. . . . X . . . . .
X	ASSURANCE PROGRAM PLAN	. . . . X . . . . .
X	AUTOMATION POLICY	X . . . . X . . . . .
X	AUTOMATION REQMTS	X . . . . X . . . . .
. . . X	AUXILIARY SYSTEM REQMTS	X . . . . X . . . . .
. . . . X . . .	AVAILABILITY (ACHIEVED)	X . . . .
. . . . X . . X . . .	AVAILABILITY ALLOCATION	X . . . .
. . . . X . . X . . .	AVAILABILITY PREDICTION	X . . . .


DATA ELEMENT
OUTPUTS FROM:
INPUTS TO:
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
AVAILABILITY GOALS
AVAILABILITY (INHERENT)
AVAILABILITY REQMTS
BUILT-IN TEST CONCEPT
CALIBRATION CRITERIA
CHANGE JUSTIFICATION
CIVILIAN PERSONNEL PLAN
CALIBRATION SUPPORT REQMTS
CLASSIFICATION CODE
CM LIMITATIONS UNDERWAY
COMMAND & CONTROL COMPATIBILITY
COMPONENT IDENTIFICATION CODE
CONDITION ASSIGNMENTS
CONFIGURATION CONSTRAINTS
CONFIGURATION REQUIREMENTS
CONFIGURATION MGMT POLICY
CONFIGURATION MGMT REQMTS
CONFIGURATION STATUS
CONSUMABLE MATERIAL
CONTRACTOR MAINT POLICY
CORRECTIVE MAINT POLICY CRITERIA

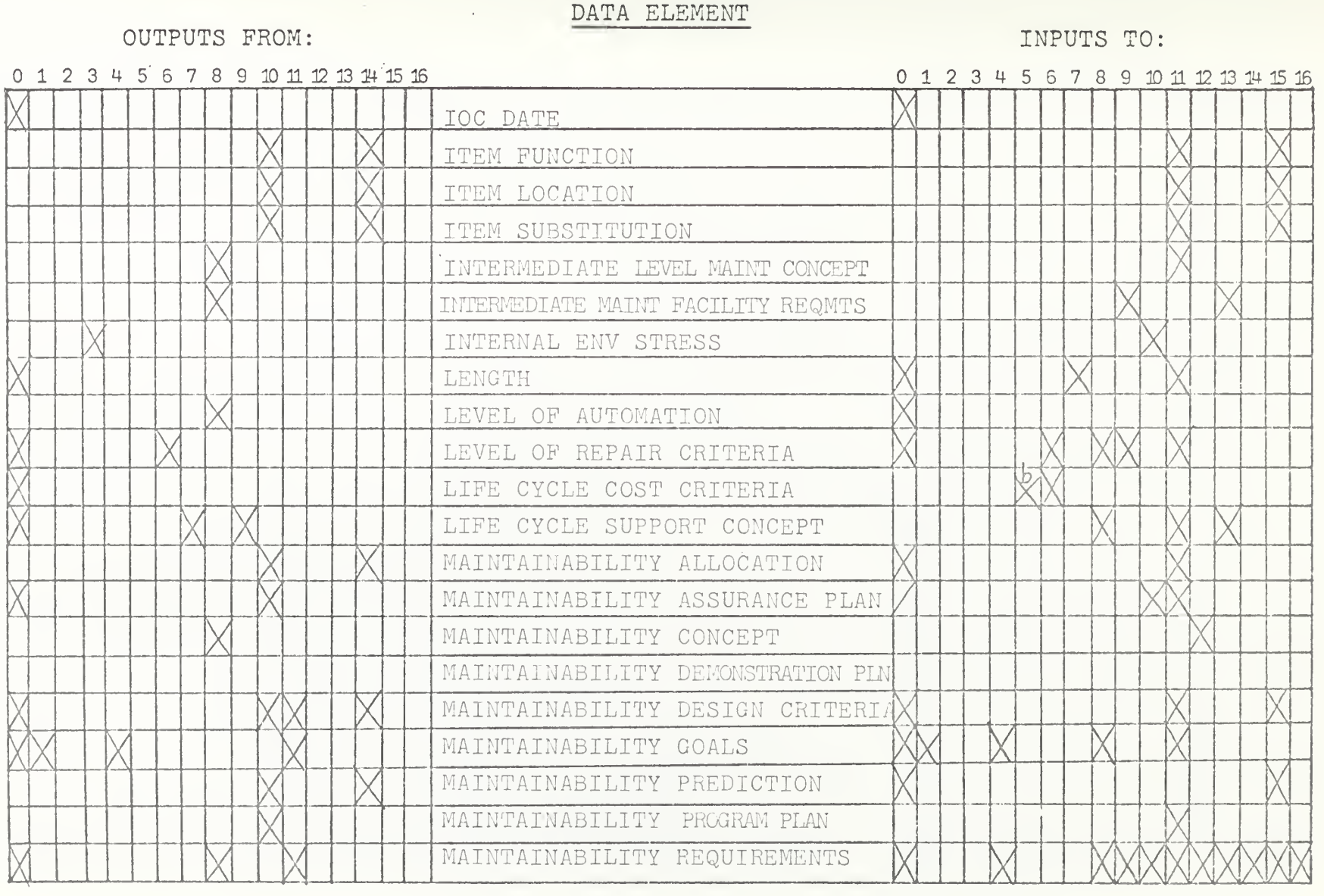

DATA ELEMENT
OUTPUTS FROM:
INPUTS TO:
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
CORRECTIVE MAINT PERSONNEL
CORRECTIVE MAINT REQMTS
COST DATA
CRITICAL TIME
CRUISE PERIOD
DATA MANAGEMENT POLICY
DEGREE OF EXPOSURE
DEMONSTRATION REPORT REQMTS
DEPENDABILITY REQMTS
DEPLOYMENT CONSTRAINTS
DEPOT MAINT FACILITY REQMTS
DEPOT LEVEL MAINT CONCEPT
DEPLOYMENT CYCLE
DESIGN CRITERIA
DESIGN SERVICE LIFE
DESIGN SPECIFICATION NUMBER
DESIGN DATA
DESIRED CAPABILITY
DIFFERENCE IN PART APPL
DIMENSIONAL CONSTRAINT
DOCUMENT CONTROL NUMBER


DATA ELEMENT
OUTPUTS FROM:
INPUTS TO:
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
DOWNTIME
DRAWING NUMBER
ECONOMIC EVALUATION
ELECTRICAL COMPATIBILITY REQ
ELECTRONIC COMPATIBILITY REQ
ELECTRICAL REQUIREMENTS
EMISSION CONTROL REQMTS
EMERGENCY DESTRUCTION REQ
END ARTICLE CONTRACT NO
END ARTICLE ITEM NO
END ARTICLE MODEL NO
END ARTICLE PART NO
END ARTICLE QUANTITIES
END ARTICLE TYPE NO
ENGINEERING CHANGE PROPOSAL
ENG DESIGN CHANGE NUMBER
ENGINEERING DRAWINGS
ENVIRONMENTAL CONSTRAINTS
ENV IMPACT POLICY
ENVIRONMENTAL REQUIREMENTS
EQUIPMENT CATEGORY

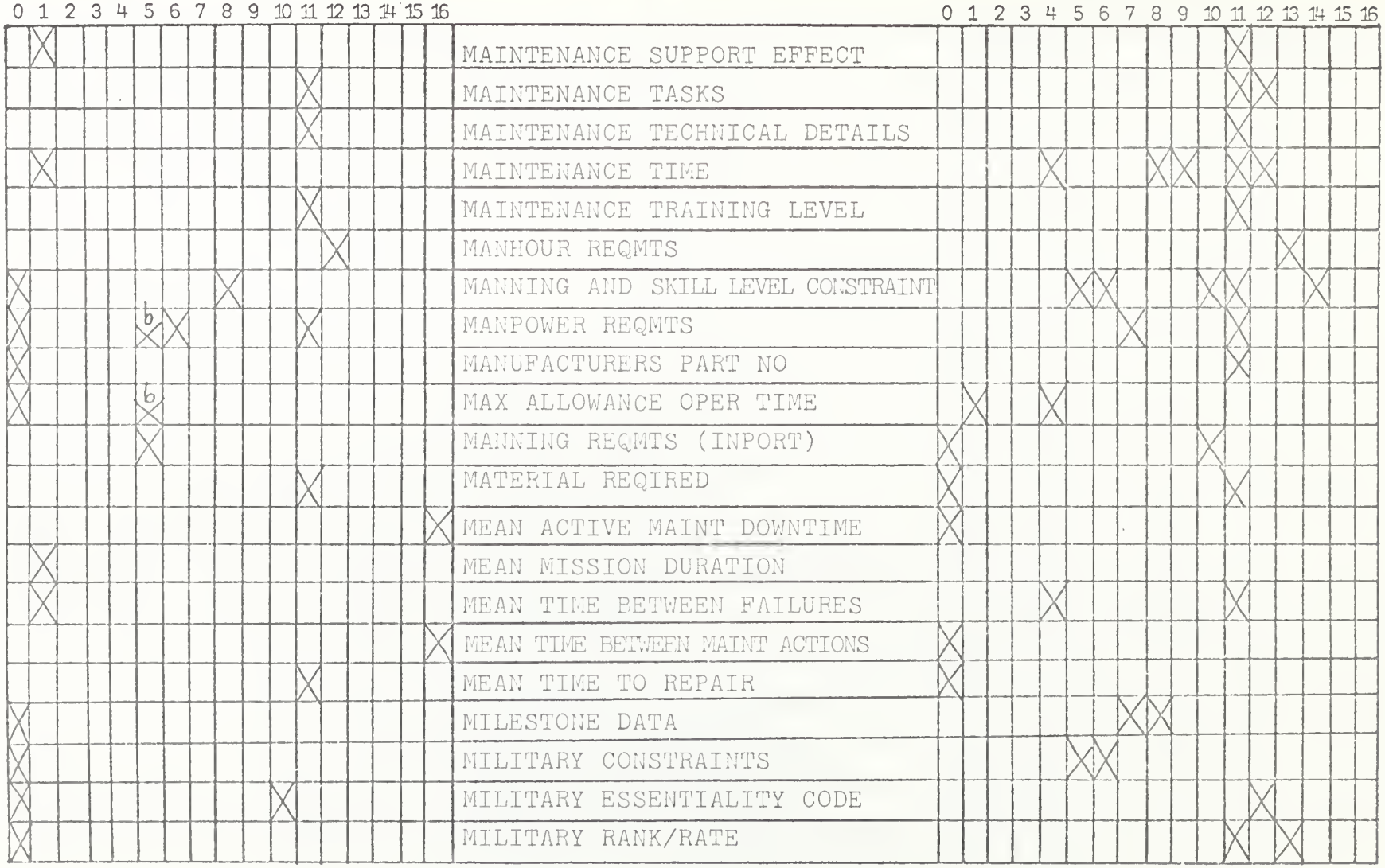
OUTPUTS FROM: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	DATA ELEMENT	INPUTS TO: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
X	EQUIPMENT ACCESSIBILITY	X
X	EQUIPMENT ID CODE	X
X	EQUIPMENT MODEL DESIGNATION	X
X	EQUIP OVERHAUL APPROACH	X X X
X	ESTIMATED OVERHAUL COST	X
X	ESTIMATED QUANTITY	X X
X	ESTIMATED UNIT PRICE	X
X	EXTERNAL ENV STRESSES	X X
X	FACILITIES AVAILABILITY	X X X
X	FACILITIES CONCEPT	X X X
X	FACILITIES CHARACTERISTICS	X
X	FACILITIES DESIGN CRITERIA	X
X	FACILITIES LOCATION	X
X X	FACILITIES REQUIREMENTS	X X X X X
X X	FAIL SAFE CHARACTERISTICS	X X
X	FAIL SAFE REQUIREMENTS	X
X	FAILURE CRITICALITY	X
X	FAILURE DETECTION METHOD	X X
X	FAILURE EFFECTS	X
X	FAILURE HISTORY	X
X	FAILURE MODE	X

DATA ELEMENT

OUTPUTS FROM: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	DATA ELEMENT	INPUTS TO: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
	FAILURE RATE	
	FAILURE SYMPTOMS	
	FAULT ISOLATION CONCEPT	
	FEDERAL STOCK NO	
	FLEET INTRODUCTION DATE	
	FREQUENCY OF OCCURRENCE	
	FAULT/FAILURE SIMULATION METHODS	
	FACILITY FUNCTIONAL ANALYSIS	
b	FUNCTIONAL COMPATIBILITY	b
	GPTE REQUIREMENTS	
	GEOGRAPHIC OP CONSTRAINT	
	HEIGHT	
	HUMAN COMPATIBILITY	
	HUMAN FACTORS CONSTRAINTS	
	HUMAN FACTORS REQMTS	
	IMPORTANCE CLASSIFICATION	
	INACTIVE TIME	
	INPORT TIME/PERIOD	
	INSTALLATION CONSTRAINTS	
	INSPECTION REQUIREMENT	
	INVENTORY COST	

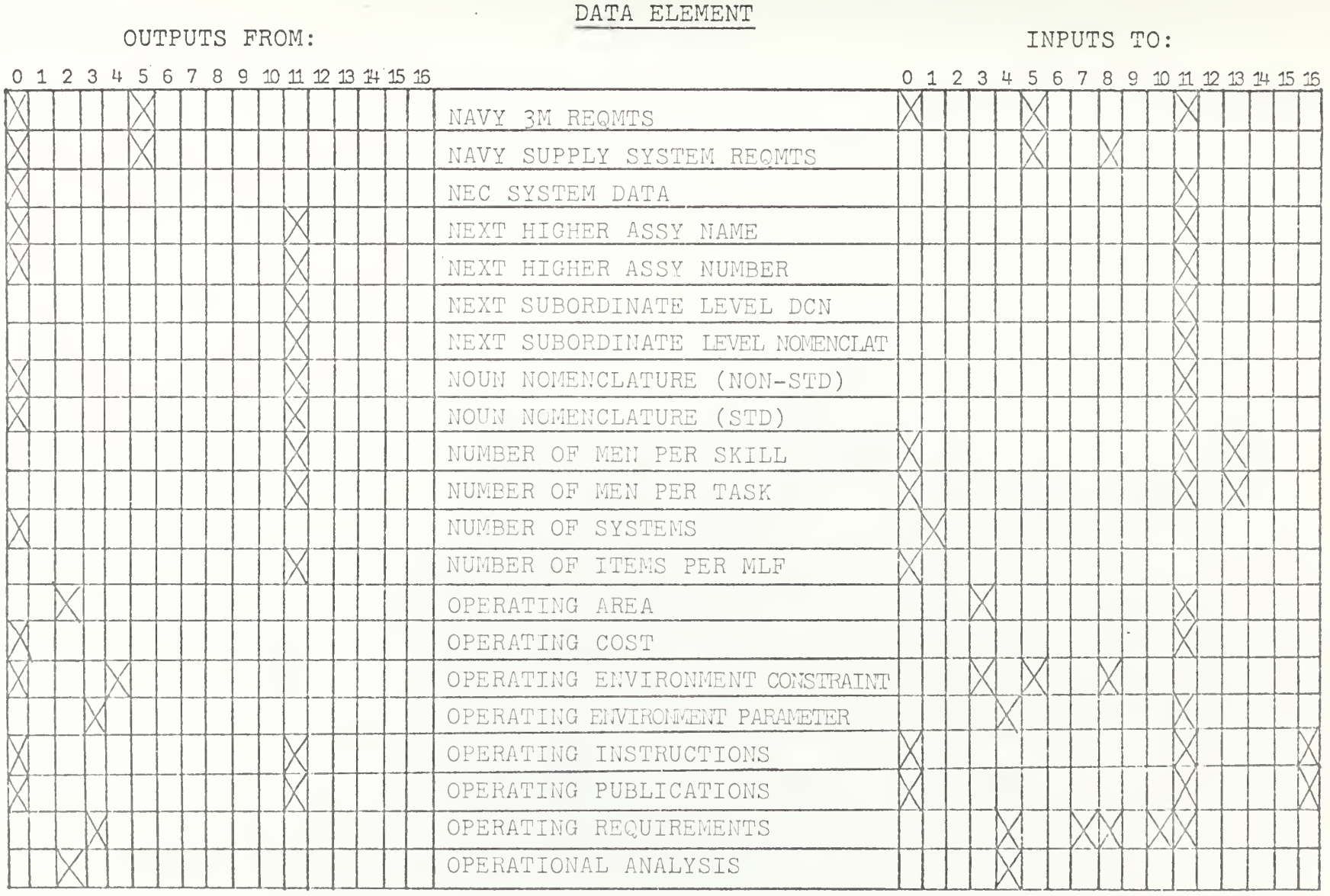

DATA ELEMENT
OUTPUTS FROM:
INPUTS TO:
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
IOC DATE
ITEM FUNCTION
ITEM LOCATION
ITEM SUBSTITUTION
INTERMEDIATE LEVEL MAINT CONCEPT
INTERMEDIATE MAINT FACILITY REQMTS
INTERNAL ENV STRESS
LENGTH
LEVEL OF AUTOMATION
LEVEL OF REPAIR CRITERIA
LIFE CYCLE COST CRITERIA
b
LIFE CYCLE SUPPORT CONCEPT
MAINTAINABILITY ALLOCATION
MAINTAINABILITY ASSURANCE PLAN
MAINTAINABILITY CONCEPT
MAINTAINABILITY DEMONSTRATION PLN
MAINTAINABILITY DESIGN CRITERIA
MAINTAINABILITY GOALS
MAINTAINABILITY PREDICTION
MAINTAINABILITY PROGRAM PLAN
MAINTAINABILITY REQUIREMENTS

OUTPUTS FROM: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	DATA ELEMENT	INPUTS TO: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
	MAINTAINABILITY REQMTS FREQ/YR	
	MAINTENANCE AIDS	
	MAINTENANCE ACTIVITY LOCATION	
	MAINTENANCE ACTIVITY REQMTS	
	MAINTENANCE ACTIVITY CONCEPT	
	MAINT DEMONSTRATION ENVIRONMENT	
	MAINTENANCE DOCUMENTATION REQMTS	
	MAINTENANCE ENGINEERING ANALYSIS RPT	
	MAINTENANCE FREQUENCY	
	MAINTENANCE INDEX PAGE (MIP)	
	MAINTENANCE IDENTIFICATION CODE	
	MAINTENANCE LEVEL FUNCTION (MLF)	
	MAINTENANCE LEVEL REQMTS	
	MAINTENANCE LEVEL POLICY	
	MAINTENANCE MANHOURS/YR	
	MAINTENANCE PERSONNEL REQMT	
	MAINTENANCE REQUIREMENTS	
	MAINTENANCE PUBLICATIONS	
	MAINTENANCE REQUIREMENT CARD (MRC)	
	MAINT REQ FREQ/YR	
	MAINTENANCE SPECIFICATIONS	


DATA ELEMENT
OUTPUTS FROM:
INPUTS TO:
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
MAINTENANCE SUPPORT EFFECT
MAINTENANCE TASKS
MAINTENANCE TECHNICAL DETAILS
MAINTENANCE TIME
MAINTENANCE TRAINING LEVEL
MANHOUR REQMTS
MANNING AND SKILL LEVEL CONSTRAINT
MANPOWER REQMTS
MANUFACTURERS PART NO
MAX ALLOWANCE OPER TIME
MANNING REQMTS (INPORT)
MATERIAL REQIRED
MEAN ACTIVE MAINT DOWNTIME
MEAN MISSION DURATION
MEAN TIME BETWEEN FAILURES
MEAN TIME BETWEFN MAINT ACTIONS
MEAN TIME TO REPAIR
MILESTONE DATA
MILITARY CONSTRAINTS
MILITARY ESSENTIALITY CODE
MILITARY RANK/RATE

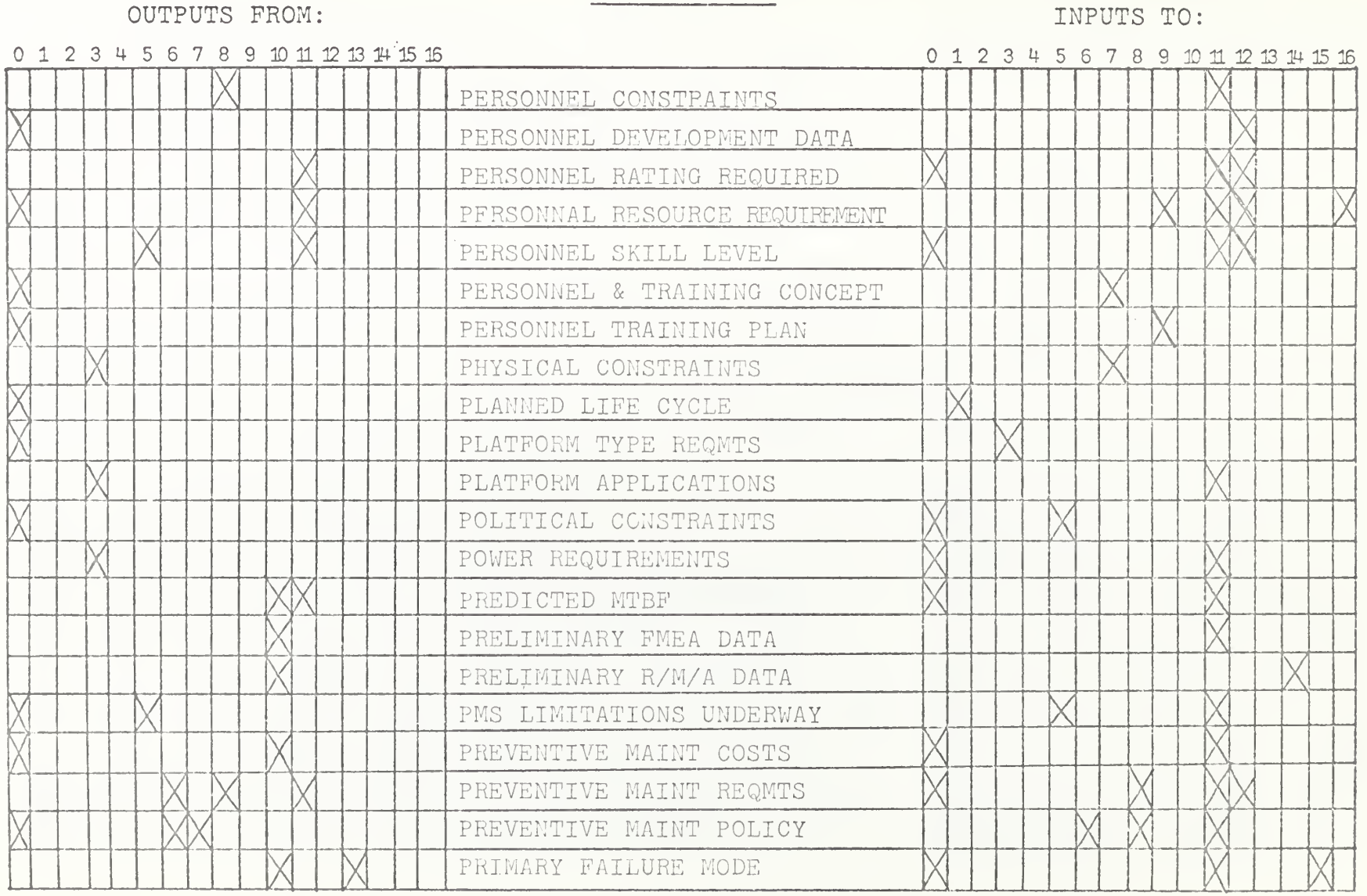
DATA ELEMENT

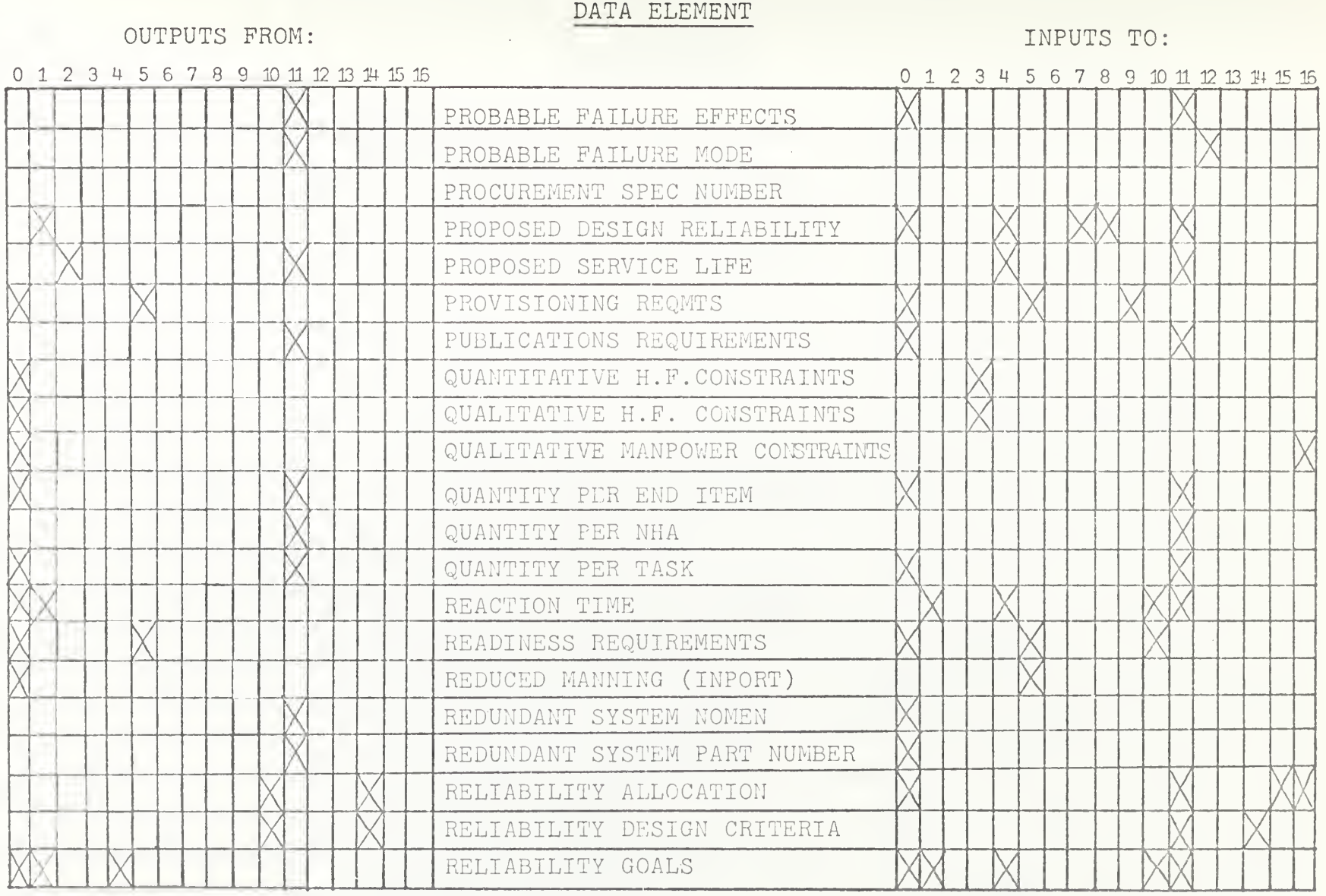
OUTPUTS FROM: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	DATA ELEMENT	INPUTS TO: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
X X	MINIMUM SAFETY REQMTS	X
X	MINIMUM ACCEPT REQMTS	X X X
X	MODIFICATION NUMBER	X X
X	MODIFICATION TIME	X X X X
X	MOBILITY REQMT	X X
X	MODEL DESIGNATOR	X X
X	MODERNIZATION PGM CONSTRAINTS	X X X
X X X	MODERNIZATION TIME	X X X X X
X	MOST CRITICAL REQMT	X X
X	MOTION CONSTRAINTS	X
X	MISSION ANALYSIS	X
X	MISSION FUNCTIONS	X X
X X X	MISSION REQUIREMENTS	X X X X
X X X	MISSION PROFILE TIME FACTOR	X X X X
X X X	MISSION TIME	X X X X X X
X	MTTR ACHIEVED	X
X	MTTR GOAL	X
X	NATURAL CONSTRAINTS	X
X	NATURAL ENVIRONMENT DATA	X
X	NAVORD DRAWING NUMBER	X
X	NAVY ENLISTED CLASSIFICATION	X X

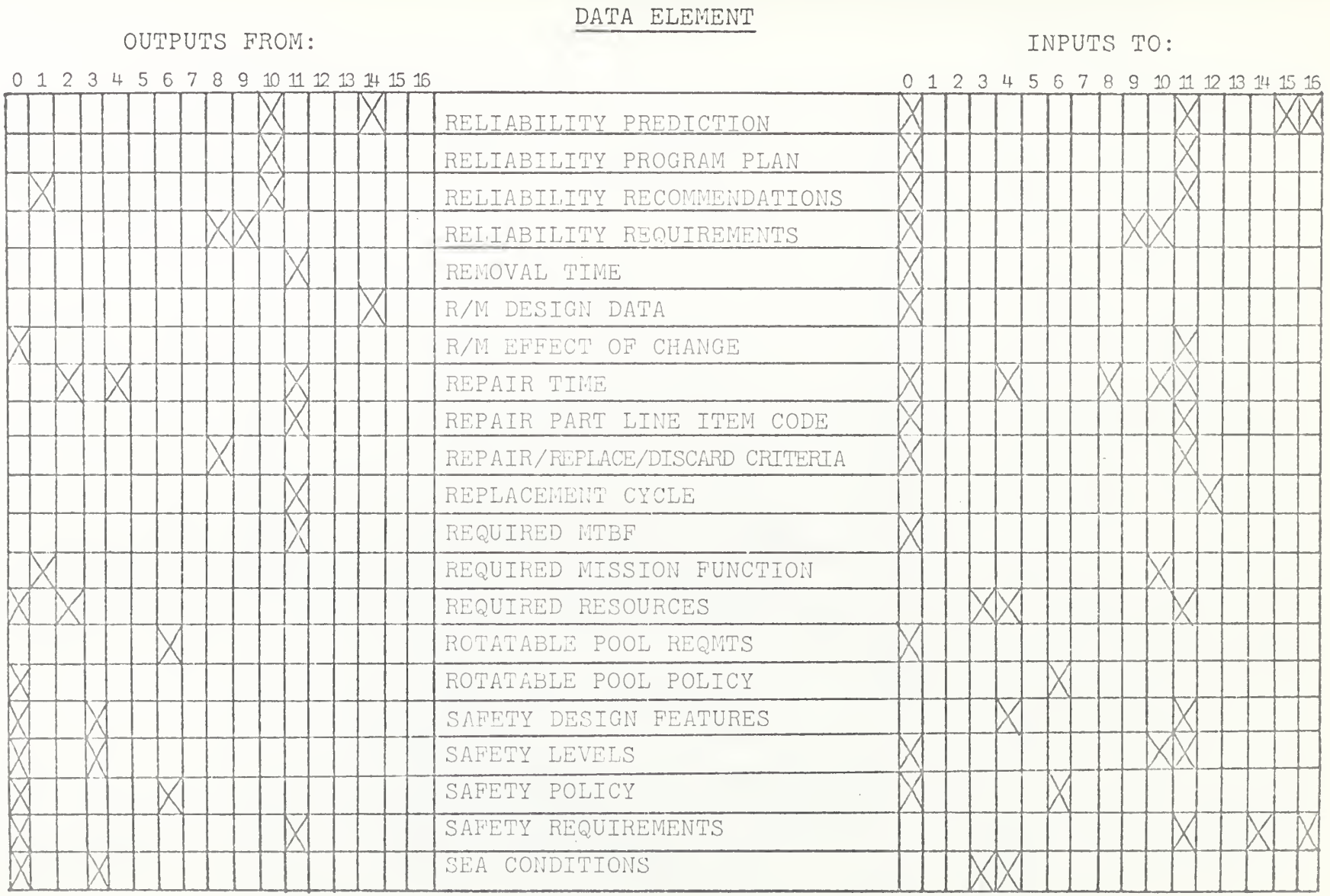

DATA ELEMENT
OUTPUTS FROM:
INPUTS TO:
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
NAVY 3M REQMTS
NAVY SUPPLY SYSTEM REQMTS
NEC SYSTEM DATA
NEXT HIGHER ASSY NAME
NEXT HIGHER ASSY NUMBER
NEXT SUBORDINATE LEVEL DCN
NEXT SUBORDINATE LEVEL NOMENCLAT
NOUN NOMENCLATURE (NON-STD)
NOUN NOMENCLATURE (STD)
NUMBER OF MEN PER SKILL
NUMBER OF MEN PER TASK
NUMBER OF SYSTEMS
NUMBER OF ITEMS PER MLF
OPERATING AREA
OPERATING COST
OPERATING ENVIRONMENT CONSTRAINT
OPERATING ENVIRONMENT PARAMETER
OPERATING INSTRUCTIONS
OPERATING PUBLICATIONS
OPERATING REQUIREMENTS
OPERATIONAL ANALYSIS

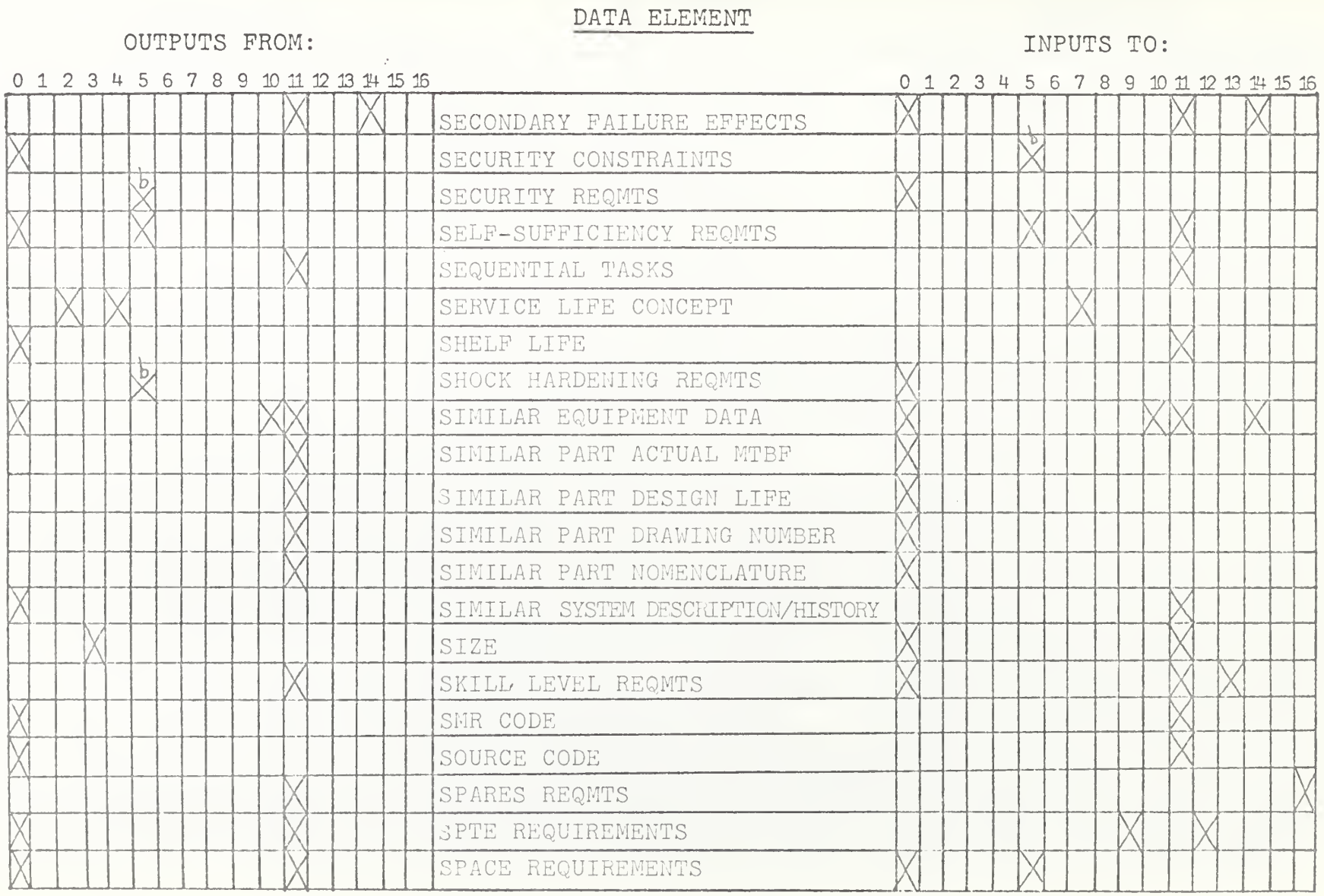
DATA ELEMENT

OUTPUTS FROM: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	DATA ELEMENT	INPUTS TO: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
2	OPERATIONAL CONCEPT	10 14
0	OPERATIONAL ENDURANCE	5
2	OPERATIONAL PROFILE	4 8 10 11
0	OPERATOR PERSONNEL PLAN	9
0	OPERATOR/MAINT PERSONNEL PLAN	9
0 8 12	ORGANIZATIONAL MAINT FACILITIES	9 13
0 10	ORGANIZATIONAL MAINT PERSONNEL REQ	13
8	ORGANIZATIONAL LEVEL MAINT CONCEPT	11
11	ORGANIZATIONAL MAINT REQMT	13
0 11	ORGANIZATIONAL MAINT SKILL LEVELS	13
4 6	OVERHAUL CYCLE CONSTRAINTS	5 8 10 11
6 7	OVERHAUL CYCLE CRITERIA	6 8 11
0	OVERHAUL PERIOD	1
7	OVERHAUL/TAV CONCEPT	8 11
0 11	PART NUMBER	11
11	PARTS REQUIRED	12
0	PARTICIPATING AGENCY	16
4	PERFORMANCE GOALS	0 11
0	PERFORMANCE SPECIFICATIONS	1 4
0	PERSONNEL ALLOWANCE	4 6
0	PERSONNEL AVAILABILITY	4 6


DATA ELEMENT
OUTPUTS FROM:
INPUTS TO:
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
PERSONNEL CONSTRAINTS
PERSONNEL DEVELOPMENT DATA
PERSONNEL RATING REQUIRED
PFRSONNAL RESOURCE REQUIREMENT
PERSONNEL SKILL LEVEL
PERSONNEL & TRAINING CONCEPT
PERSONNEL TRAINING PLAN
PHYSICAL CONSTRAINTS
PLANNED LIFE CYCLE
PLATFORM TYPE REQMTS
PLATFORM APPLICATIONS
POLITICAL CONSTRAINTS
POWER REQUIREMENTS
PREDICTED MTBF
PRELIMINARY FMEA DATA
PRELIMINARY R/M/A DATA
PMS LIMITATIONS UNDERWAY
PREVENTIVE MAINT COSTS
PREVENTIVE MAINT REQMTS
PREVENTIVE MAINT POLICY
PRIMARY FAILURE MODE


DATA ELEMENT
OUTPUTS FROM:
INPUTS TO:
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
PROBABLE FAILURE EFFECTS
PROBABLE FAILURE MODE
PROCUREMENT SPEC NUMBER
PROPOSED DESIGN RELIABILITY
PROPOSED SERVICE LIFE
PROVISIONING REQMTS
PUBLICATIONS REQUIREMENTS
QUANTITATIVE H.F.CONSTRAINTS
QUALITATIVE H.F. CONSTRAINTS
QUALITATIVE MANPOWER CONSTRAINTS
QUANTITY PER END ITEM
QUANTITY PER NHA
QUANTITY PER TASK
REACTION TIME
READINESS REQUIREMENTS
REDUCED MANNING (INPORT)
REDUNDANT SYSTEM NOMEN
REDUNDANT SYSTEM PART NUMBER
RELIABILITY ALLOCATION
RELIABILITY DESIGN CRITERIA
RELIABILITY GOALS


DATA ELEMENT
OUTPUTS FROM:
INPUTS TO:
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
RELIABILITY PREDICTION
RELIABILITY PROGRAM PLAN
RELIABILITY RECOMMENDATIONS
RELIABILITY REQUIREMENTS
REMOVAL TIME
R/M DESIGN DATA
R/M EFFECT OF CHANGE
REPAIR TIME
REPAIR PART LINE ITEM CODE
REPAIR/REPLACE/DISCARD CRITERIA
REPLACEMENT CYCLE
REQUIRED MTBF
REQUIRED MISSION FUNCTION
REQUIRED RESOURCES
ROTATABLE POOL REQMTS
ROTATABLE POOL POLICY
SAFETY DESIGN FEATURES
SAFETY LEVELS
SAFETY POLICY
SAFETY REQUIREMENTS
SEA CONDITIONS


DATA ELEMENT
OUTPUTS FROM:
INPUTS TO:
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
SECONDARY FAILURE EFFECTS
SECURITY CONSTRAINTS
SECURITY REQMTS
SELF-SUFFICIENCY REQMTS
SEQUENTIAL TASKS
SERVICE LIFE CONCEPT
SHELF LIFE
SHOCK HARDENING REQMTS
SIMILAR EQUIPMENT DATA
SIMILAR PART ACTUAL MTBF
SIMILAR PART DESIGN LIFE
SIMILAR PART DRAWING NUMBER
SIMILAR PART NOMENCLATURE
SIMILAR SYSTEM DESCRIPTION/HISTORY
SIZE
SKILL LEVEL REQMTS
SMR CODE
SOURCE CODE
SPARES REQMTS
SPTE REQUIREMENTS
SPACE REQUIREMENTS
b

DATA ELEMENT

OUTPUTS FROM: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	DATA ELEMENT	INPUTS TO: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
X . . . . X	SPECIAL SUPPORT EQUIP REQ	. . . . . X . . . . X . . . . .
X . . . . X	SPECIAL TRAINING REQMTS	X . . . . X . . . . .
X	STABILITY REQMTS	. . . . X . . . .
. . . . . X	STANDARDIZATION REQMTS	X . . . .
. . . . X	STEP NUMBER	. . . . X . . . . .
X . . . . X . . . . X	STORAGE REQUIREMENTS	X . . . . X . . X . . . .
X . . . . . . X X	SUPPLY SUPPORT CONCEPT	. . . . X . . . X .
. . . . . X X X	SUPPLY SUPPORT REQMTS AND CONSTRAINTS	X . . . . a . X . . . . .
X . . . . X	SUPPORT EQUIPMENT AVAILABILITY	X . . . . X . . . . .
. . . . X	SUPPORT EQUIPMENT CAPABILITIES	X . . . .
. . . . X	SUPPORT EQUIPMENT COST	X . . . .
. . . . X	SUPPORT EQUIPMENT DESCRIPTION	X . . . .
. . . . X	SUPPORT EQUIPMENT DIMENSIONS	X . . . .
. . . . X	SUPPORT EQUIPMENT FUNCTION	X . . . .
. . . . X	SUPPORT EQUIPMENT OPERATION	X . . . .
X . . . . . X . . . X	SUPPORT EQUIPMENT REQMTS	X . . . . X . . . . . X X
X . . . . . X X	SUPPORT & TEST EQ CONCEPT	X . . . . . . X . . . X . . . . .
. . . . X	SUPPORT EQUIPMENT WEIGHT	X . . . .
. . . . . X	SUPPORT & TEST EQ REQMTS AND CONSTS	X . . . .
. . . . b	SYSTEM COMPATIBILITY CONSTRAINT	. . . . . . X . . . .
. X . . . . X	SYSTEM/SUBSYSTEM CRITICALITY	X . . . X . . . . . X X . . X . .

DATA ELEMENT

OUTPUTS FROM: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	DATA ELEMENT	INPUTS TO: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
X	SURVIVABILITY REQMTS	X
X X	SYSTEM/SUBSYSTEM DEPLOYMENT	X X X X
X X	SYSTEM EFFECTIVENESS REQ	X X X X
X X	SYSTEM EFFECTIVENESS GOALS	X X X X X
X X X	SYSTEM LIFE CYCLE	X X X X
X	SYSTEM LOCATION	X
X	SYSTEM MODERNIZATION	X X
X X	SYSTEM UTILIZATION RATE	X X X X X
X X X	SYSTEM OVERHAUL CONCEPT	X X X X X
X	SYSTEM OPERATIONAL STATE	X
X	TASK DATA CODE	X
X	TASK FUNCTION	X
X	TASK FREQUENCY	X X
X	TASK TIME	X
X X	TAV CONCEPTS	X X X X
X X	TECHNICAL DATA REQMTS	X X X
X X	TECHNICAL DATA CONCEPT	X X X
X	TECHNICAL MANUAL REQMTS	X X
X	TECHNICAL MANUAL NUMBER	X X
X	TECHNICAL QUALIFICATIONS	X
X	TEMPERATURE RANGE	X

DATA ELEMENT

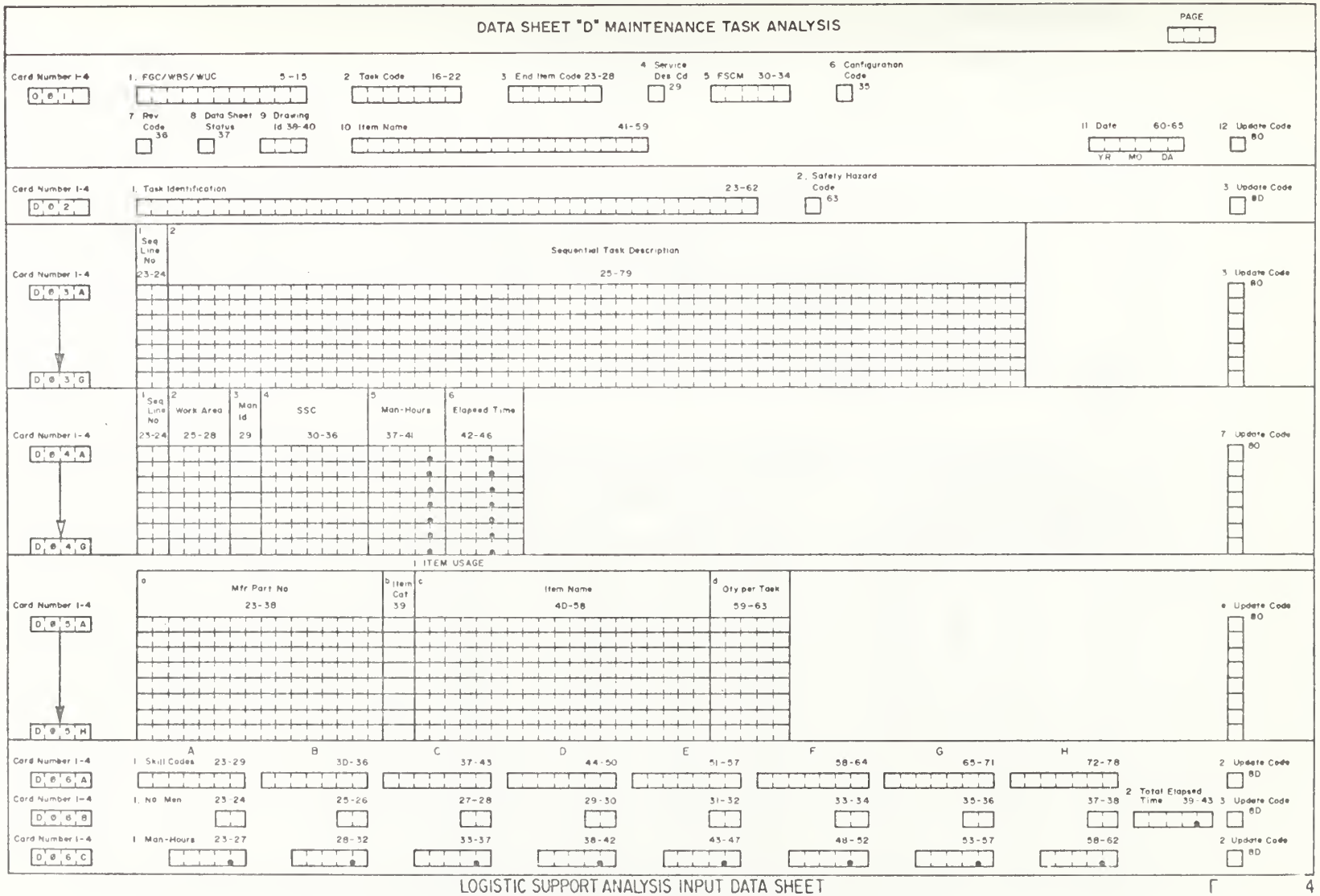
OUTPUTS FROM: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	DATA ELEMENT	INPUTS TO: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
	TENDER AVAILABILITY REQ	
	TENDER AVAILABILITY CONSTRAINTS	
	TEST EQUIPMENT REQ	
	TEST FACILITY REQMTS	
	TEST MODE OF OPERATION	
	TEST SELECTION METHOD	
	TEST SCHEDULE	
	TEST OBJECTIVES	
	TESTING CONCEPT	
	TESTING REQMTS	
	THREAT DATE	
	THREAT SCENARIO	
	THREAT SOURCE	
	TIME CONSTRAINTS	
	TIME BETWEEN OVERHAULS	
	TOLERANCE DATA	
	TOOLS REQUIRED	
	TOTAL ANNUAL TASK TIME	
	TOTAL MMH PER YEAR	
	TOTAL SERVICE LIFE	
	TRAINING FACILITY REQMTS	

DATA ELEMENT

OUTPUTS FROM:

INPUTS TO:

DATA ELEMENT	OUTPUTS FROM:	INPUTS TO:
	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
TRAINING PROGRAM AVAILABILITY	X X	X X
TRAINING REQMT CODE	X	X
TRAINING REQUIREMENTS	X	X X
TRAINING RESOURCES REQ	X X	X
TRANSPORTATION & HANDLING CONCPT	X	X
TRANSPORTATION & HANDLING REQMTS	X X	X X
TRANSPORTATION & CONSTRAINTS	X X	X
UNDERWAY CORRECTIVE MAINT	X	X
UNDERWAY PREVENTIVE MAINT	X	X
UNDERWAY TIME	X	X X X X X
UPTIME	X	X X X
UTILIZATION GOALS	X	X
VERIFIED MTBF	X X	X X
VIBRATION/SHOCK	X	X
VOLUME	X	X X
WBS NUMBER	X	X
WEIGHT	X	X
WIDTH	X	X
WIND CONDITIONS	X	X
WORK BREAKDOWN STRUCTURE	X X	X
WORKING SPACE ALLOCATIONS	X	X
WORKING SPACE REQMTS	X	X



LOGISTIC SUPPORT ANALYSIS INPUT DATA SHEET

Document Control Number

MAINTENANCE TASK ANALYSIS

WORKSHEET IV

1 Item Nomenclature _____ Part No. _____ FSN _____ NAVORD Drawing Number _____

2 Next Higher Assembly _____ Part No. _____

3 WBS _____ Drawing No. _____ EIC _____ APL/CID _____

MAINTENANCE IDENTIFICATION CODE FOR BLOCK 4	
Maintenance Level 1st Character O - Organizational I - Intermediate D - Depot	Maintenance Requirement 2nd Character A - Trouble Shoot C - Repair E - Test G - Lubricate I - Adjust K - Service B - Remove & Replace D - Inspect F - Disassemble/Assemble H - Calibrate J - Align L - Other
Maintenance Frequency 3rd Character D - Daily M - Monthly S - Semiannually C - Overhaul Cycle W - Weekly Q - Quarterly A - Annually U - Unscheduled	Reference 4th Character Refer to Appendix B, Worksheet IV, Block 4, for Explanation

4 Maintenance Identification Code	5 Maintenance Requirement	6 Facility Requirement	7 Training Reqt Code	8 Task Data Code	9 Maint. Reqmt. Freq Per Year

10 Step No	11 Sequential Maintenance Task	12 Repair Part Line Item Code	13 Consumable Materials	14 Quantity Used	15 Support Equip.	16 Logistic Support Personnel Resource Requirements			
						a Task Time	b No. of Men	c Rating and Skill Level	d NEC

GLOSSARY

AVAILABILITY (Achieved) - The probability that a system or equipment when used under stated conditions in an ideal support environment will operate satisfactorily at any given time. Availability (achieved) excludes supply downtime and waiting or administrative downtime.

AVAILABILITY (inherent) - The probability that a system or equipment when used under stated conditions without consideration for any scheduled or preventive maintenance action and in an ideal support environment will operate satisfactorily at any given time. Availability (inherent) excludes ready time, preventive maintenance action downtime, and waiting or administrative downtime.

ADVANCED DEVELOPMENT OBJECTIVE (ADO) - A requirements document prepared by the CNO which states a need to conduct certain experimental studies, tests and development effort. The ADO states the overall mission to be performed and specifies the critical factors which need to be resolved before the full system development can proceed.

CONTRACT DATA REQUIREMENTS LIST (CDRL) - A listing, by title and number on the DD Form 1423, of all data products required to be delivered to the Government by the contractor.

CONFIGURATION MANAGEMENT - A discipline applying technical

and administrative direction and surveillance to (1) identify and document the functional and physical characteristics of a configuration item, (2) control changes to those characteristics, and (3) record and report change processing and implementation status.

DESIGN CRITERIA FOR LOGISTICS ELEMENTS (DCLE) - An ILS/System Engineering interface document developed from the overall Logistics Concept and the derived Maintenance and Supply Support Concept.

DEVELOPMENT CONCEPT PAPER (DCP) - A document prepared by the DOD Component under the direction of Director, Defense Research and Engineering (DDR&E) to define program issues, including special logistics problems, program objectives, program plans, performance parameters, areas of major risk, system alternatives and acquisition strategy.

DATA ITEM DESCRIPTION (DID) - DD Form 1664 which contains specific references or detailed instructions for preparation of data products.

INITIAL OPERATIONAL CAPABILITY (IOC) - Date of attainment of the capability to employ effectively a weapon, item of equipment, or system of approved specific characteristics, and which is manned or operated by an adequately trained, equipped, and supported military unit or force.

LEVEL OF REPAIR ANALYSIS (LOR) - A term assigned to a technique which establishes (1) whether an item should be repaired; (2) at what maintenance level, i.e.,

organizational, intermediate, or depot; or (3) if the item should be discarded.

LOGISTIC SUPPORT ANALYSIS (LSA) - A process by which the logistics support necessary for a new system/equipment is identified. It includes the determination and establishment of logistics support design constraints, consideration of those constraints in the design of the "hardware" portion of the system, and analysis of design to validate the logistic support feasibility of the design, and to identify and document the logistic support resources which must be provided as a part of the system/equipment to the operating forces.

LOGISTIC SUPPORT ANALYSIS RECORD (LSAR) - The final documentation of the logistic support analysis, recorded in deliverable form, that is the basic source of data related to the maintenance and logistic support for a specific item.

MAINTENANCE ENGINEERING ANALYSIS (MEA) - A process by which persons with specialized experience in the area of maintenance examine the actual or proposed design of a system/equipment to identify and/or propose characteristics by which the required logistic resources are identified.

MAINTENANCE ENGINEERING ANALYSIS RECORD (MEAR) - The final documentation of the maintenance engineering analysis, compiled in deliverable form, that is the basic source of

data related to the maintenance and logistic support for a specific item.

MEAN-TIME-BETWEEN-FAILURES (MTBF) - For a particular interval, the total functioning life of a population of an item divided by the total number of failures within the population during the measurement interval. The definition holds for time, cycles, miles events, or other measures of life units.

MAINTAINABILITY - A characteristic of design and installation which is expressed at the probability that an item will be retained in or restored to a specified condition within a given period of time, when the maintenance is performed in accordance with prescribed procedure and resources.

MEAN TIME BETWEEN MAINTENANCE ACTIONS (MTBMA) - The mean of the distribution of the time intervals between maintenance actions (either preventive, corrective, or both).

MEAN TIME TO REPAIR (MTTR) - The total corrective maintenance time divided by the total number of corrective maintenance actions during a given period of time.

PREVENTIVE MAINTENANCE (PM) - The care and servicing needed to maintain equipment and facilities in satisfactory operating condition by providing for systematic inspection, detection, and correction of incipient failures either before they occur or before they develop into major defects.

PROPOSED TECHNICAL APPROACH (PTA) - A document prepared within the Naval Material Command or other cognizant Commands for the Chief of Naval Operations in which the tentative approaches to achieve a capability are presented.

SOURCE, MAINTENANCE AND RECOVERABILITY (SM&R) CODE - A collective code assigned to items during the provisioning source coding or selection process to convey specific intelligence to maintenance and supply personnel. The SM&R code is comprised of three parts consisting of a source code, a maintenance code and a recoverability code.

SPECIFIC OPERATIONAL REQUIREMENT (SOR) - A formal document in which the Chief of Naval Operations states a need for development of new or improved capabilities to counter a specific threat or to satisfy an operational deficiency.

TECHNICAL DEVELOPMENT PLAN (TDP) - Document prepared by the Principal Development Activity (PDA) for conveying the details of development necessary for effective management review prepared in response to an Advanced Development Objective (ADO) or a Specific Operations Requirement (SOR).

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Integrated Logistic Support
Maintenance Planning
Information Requirements

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This thesis utilizes a conceptual model for determining information requirements for one Integrated Logistic Support element (Maintenance Planning). The development is oriented to the Naval Ordnance Systems Command (NAVORD) by presenting the existing NAVORD

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system and using Naval Ordnance Requirements (OR-30) in the development of the information requirements.

Following a brief overview of Integrated Logistic Support and its system life cycle (acquisition phases) implementation, the specific data flows for Maintenance Planning are presented which identify the data or information, the source (input) and destination (output) of that data and the form/units of the data. A code is used to simplify the source/destination identification and a detailed alphabetic matrix shows a consolidated distribution of input and output locations for each data element.

Thesis
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An analysis of maintenance planning information requirements for integrated logistic support oriented to the Naval Ordnance Systems Command.